VERBAL PRAGMATIC CHARACTERISTICS OF 4-5 YEAR-OLD SAUDI BOYS WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER (ADHD)

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Declaration

I confirm that the thesis submitted is my own work and that appropriate credit has been given where reference has been made to the work of others.

Wael A. Al-Dakroury

November 2013

Dedication

I dedicate this work to my wife, Rasha, who trusted me, for her sustained support, enthusiasm, inspiration, and endless patience; to my children, Ahmed, Omar, and Yousife, for their valuable sacrifices; to my parents, for all their prayers and support over the years and last but not least, to all children and their families who participated in this study.

I Love You All

Publications and presentations from the thesis

The following papers, conference presentations, and workshops resulted from work on this thesis

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Abstract

This study investigated verbal pragmatic skills in Saudi Arabian children with attention deficit hyperactivity disorder (ADHD). It examined quantitatively the verbal output, turns, topic related skills, and interlocutor impact in the children with ADHD compared to age-matched typically developing (TD) children. Also, a qualitative approach was used to investigate the mother-child interaction in children with ADHD compared to TD children with respect to conversational contributions and repair by the mother and the complexity of responses from the child. Another goal of the study was developing an audio-visual language sample database for Saudi Arabian Arabic speaking children.

The participants were twenty 4-5 year old Saudi boys. Ten were typically developing and ten had a diagnosis of ADHD. A 30 minute sample of speech during free play was collected from each child in conversation with an unfamiliar adult interlocutor and a 15 minute sample of speech was collected during free play with a familiar interlocutor (the mother). All sessions were recorded on DVD using two video cameras. Transcription and coding systems were used to analyze the data. Comparisons were made between the TD children and the children with ADHD using quantitative and qualitative techniques.

The results of the quantitative study showed that children with ADHD have a reduced verbal output with respect to total number of words, total number of verbal turns and average number of words per turn compared to typically developing children of similar age. Also, participants with ADHD showed a significantly higher topic initiation to topic maintenance ratio compared to TD participants in the sessions with the unfamiliar interlocutor. No significant effect of interlocutor was found. The results of the qualitative study revealed that verbal skills are more challenging for children with ADHD relative to their unaffected peers which is presented by more frequent “no verbal response” than TD participants and use of more single word productions during their interactions with FI. However the incidence of “mazes” did not differentiate the children with ADHD from TD children. The mothers of children with ADHD were found to be more directive in conversation, to use "what" and "yes/no" questions more frequently and they had a greater tendency to use non-verbal cues.

The differences were interpreted as evidence of the negative effect of the core behavioural characteristics of ADHD on verbal pragmatic skills and the presence of weak discourse skills in children with ADHD compared to TD age-matched children. The results also reveal the importance of investigating mother-child interaction variables in an attempt to understand the effect of parental style on the verbal skills of the children with ADHD. We have at this stage no means of telling whether the reduced verbal productivity is merely a by-product of non-linguistic core behavioural characteristics of this disorder or whether it stems from a core linguistic pragmatic deficit which is (or can be) an integral part of the disorder itself. The clinical implications are that very careful attention is needed in assessing children with ADHD to determine the nature and the extent of their language-use difficulties. Language-use difficulties exhibited by children with ADHD may be associated with a lack of social competence, which will be reflected in their conversational skills. The analysis provides the speech language pathologist with information that could assist them, by giving them a better understanding of children with ADHD, which would lead to more comprehensive assessments and more effective intervention and parent training programs.

Main abbreviations used in the thesis

FI	Familiar Interlocutor
UI	Unfamiliar Interlocutor
E	Examiner
M	Mother
ADHD	Attention Deficit Hyperactivity Disorder
TD	Typically Developing
JISH	Jeddah Institute for Speech and Hearing
ASHA	American Speech-Language-Hearing Association
QMU	Queen Margret University
DSM	Diagnostic Statistical Manual
ICD	The International Classification of Diseases-10
AFTA	ADHD Saudi Society
TI	Topic Initiation
TM	Topic Maintenance

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STRUCTURE OF THE THESIS

The thesis is divided into Part One, which is mainly concerned with a quantitative analysis of the data and Part Two, which is mainly concerned with a qualitative analysis. Part One comprises chapters 1-4, of which chapter 1 contains a review of the literature on ADHD, with special reference to its possible association with language disorder and chapters 2 and 3 describe the method and results, respectively, of the quantitative analysis. Chapter 4 offers an interpretation of the results. Part Two comprises chapters 5-6, of which chapter 5 is an account of the qualitative analysis, while chapter 6 offers a critical discussion of both studies (i.e., those of Part One and Part Two), their possible clinical implications and some suggestions for future research, followed by a conclusion to the thesis.

PART ONE

CHAPTER ONE

1.1 Introduction

Attention Deficit Hyperactivity Disorder (ADHD) refers to the presence of pronounced difficulties in the areas of inattention, distractibility and hyperactivity that lead to significant impairment in academic and social functioning (American Psychiatric Association, 2013). A diagnosis of ADHD is therefore made on the basis of the existence of behavioural patterns assessed by a medical professional who is either a child or adolescent psychiatrist or a pediatrician specializing in child development. The prevalence estimate of ADHD is as wide as 3%-10% in the USA for school age children (Weyandt, 2007 & Brown, 2009) and it is identified as one of the most commonly diagnosed clinical conditions affecting the student population (Willcut, 2012). Two-thirds of children with ADHD have an additional coexisting disorder (Barkley, 2006) and more than one-third have at least three comorbid conditions (Barkley, 2010) e.g., anxiety, conduct disorders, depression, and learning disability. Estimates of the overlap between speech and language disorders and ADHD vary from as low as 8% to as high as 90%, depending on the source and type of sample (Brown, 2009). In their seminal review of language deficits that are associated with ADHD, Camarata and Gibson (1999) highlighted the predominance of difficulties in the area of pragmatics (i.e., difficulties in social use of language). Richard and Russell (2001) identified that discourse, managing topic maintenance, topic switch, and associative topic control in conversation could be compromised. While it is recognized that these aspects of language are sensitive to cultural influences prevalence estimates of ADHD occurrence across a variety of

different countries tend to reflect those reported for the USA. This is certainly the case in Saudi Arabia where a study by Al-Yami (1993) based on data collected from 500 school age children (6-7 years old) showed prevalence figures of 9.6%. While this implies that the diagnosis of ADHD based on behavioural difficulties is capturing a universal condition, what is less clear is the extent to which the communication consequences of ADHD for some children are generic. The assessment of pragmatic language skills in the USA is typically based on a combination of the results of standardized assessments (e.g., The Test of Pragmatic Language (TOPL), Phelps-Terasaki & Phelps-Gunn, 1992), comparison of systematic observation with typical development and questionnaire evidence (e.g., Children Communication Checklist-2™ (CCC-2), Bishop, 2003) from parents/caregivers and educational settings (e.g., kindergarten and school). Within the Saudi Arabian context there are currently no standardized language assessments in Arabic available. Therefore clinicians typically resort to western assessments which are translated into Arabic, despite concerns about their validity and reliability. The use of age norms must also be treated with caution. While systematic observation of communication behaviour can be made there is also a current lack of information describing typical development and nothing describing the development of pragmatic behaviour. With regard to the use of validated questionnaires, again, cultural differences would also preclude their use.

The motivation for this study is to begin the process of identifying communication behaviours that distinguish children with a diagnosis of ADHD from those who are typically developing, with a view to developing assessment instruments. The focus of

the study is to compare four key aspects of verbal pragmatic skills of two populations of Saudi Arabian boys between the ages of 4-5 years old, one which is typically developing and the other with a diagnosis of Attention Deficit Hyperactivity Disorder (ADHD).

Chapter one gives some background to this study. It begins in section 1.2 with an overview of Attention Deficit Hyperactivity Disorder (ADHD), this includes presenting characteristics, possible aetiology, prognosis and co-morbidity, and an overview of ADHD services in Saudi Arabia. Section 1.3 describes the speech and language disorders associated with ADHD followed by an overview of speech and language services in relation to ADHD in Saudi Arabia. An overview of language disorder is given in section 1.4. Section 1.5 includes a description of pragmatics and discussion of the current debate between the formalist and functionalist perspectives, pragmatic disorders and specifically pragmatic disorders in ADHD, and how pragmatic ability is assessed. This is followed, in section 1.6, by a discussion of the targeted verbal pragmatic behaviours measured in this study; verbal output, turns, topic (which includes a discussion of Topic Initiation and Topic Maintenance), and interlocutor impact. A discussion of the possible impact that the Saudi Arabian cultural context might have on verbal pragmatic behaviour is in section 1.7. Section 1.8 describes the purpose of the study. Section 1.9 includes the research aims. The chapter concludes in section 1.10 with the hypotheses generated.

1.2 Attention Deficit Hyperactivity Disorder (ADHD)

This section begins with a definition of ADHD. Section 1.2.1 includes a brief overview of how the definition has evolved and current debate about how the disorder

will be classified in future. This is followed by consideration of current views about potential aetiological factors in 1.2.2. In section 1.2.3 the prevalence and gender of ADHD are discussed, followed by an assessment of the factors associated with onset and prognosis in section 1.2.4. Section 1.2.5 presents an overview of ADHD comorbidity. This section ends with 1.2.6 that includes a review of the status of ADHD in the Saudi Arabian context.

1.2.1 Definitions and diagnosis of ADHD

The conceptualization of the condition of ADHD has undergone several significant developments in the last two centuries. This section therefore starts with a historical overview of ADHD in section 1.2.1.1, this is followed by a discussion of the current definitions in the light of the two major world classificatory frameworks of disease, The Diagnostic and Statistical Manual IV (DSM-IV) and The International Classification of Diseases-10 (ICD-10) in section 1.2.1.2. Future considerations are covered in section 1.2.1.3. Diagnostic considerations are presented in section 1.2.1.4.

1.2.1.1 History

According to Dykman (2005) the symptoms currently associated with ADHD have been recognized in children since the 1800s. They were as mentioned in a nursery rhyme written by Heinrich Hoffman in 1863.

"Phil, stop acting like a worm,

The table is no place to squirm."

Thus speaks the father to his son,

severely says it, not in fun.

Mother frowns and looks around

although she doesn't make a sound.

But Phillip will not take advice,

he'll have his way at any price.

He turns,

And churns,

he wiggles

and jiggles

Here and there on the chair,

"Phil, these twists I cannot bear." (quoted in Silver, 2004)

A series of papers presented to the Royal College of Physicians by Gorge Still in 1902 are credited with formally identifying symptoms in children, who would now be classified as having ADHD (Weyandt, 2007). From this period up until the late 1950s researchers and clinicians claimed these symptoms were linked to brain damage. This was referred to as minimal brain dysfunction (MBD) despite the lack of evidence to support this theory. The second edition of the Diagnostic and Statistical Manual (DSM-II) in 1968 included the diagnostic criteria of hyperkinetic reaction disorder of childhood for the first time and the symptoms were hyperactivity, attention problems and distractibility. Importantly however at that time it was believed that children would

outgrow the disorder by adolescence. The third edition of the Diagnostic and Statistical Manual (DSM-III) in 1980 presented a new diagnostic label: Attention Deficit Disorder (ADD), with two subtypes - with or - without hyperactivity. The revised edition of DSM-III (DSM-III-R) that was released in 1987 included the presence and pervasiveness of three core symptoms (inattention, impulsivity, and hyperactivity). In 1994, the fourth edition of the Diagnostic and Statistical Manual (DSM-IV) changed the Attention Deficit Disorder (ADD) diagnostic category to Attention Deficit Hyperactivity Disorder (ADHD). In 2000, the fourth edition (text revised) was released. It is important to highlight that the DSM-IV-TR of ADHD diagnosis has gone through many changes since a biologically based problem of inattentiveness and over activity was first proposed by Still in 1902 (Cooper & O'Regan, 2001). Table 1.1 provides a summary of the historical overview described in this section.

Table 1.1 ADHD historical information (Weyandt, 2007, Table1.1, p. 3)

1902	Symptoms Described by Dr. George Still.
1950	Minimal Brain Dysfunction (MBD). Focus on Hyperactivity Symptoms.
1968	*DSM-II;* Hyperkinetic Reaction Disorder of Childhood. Focus Remained on Hyperactivity Symptoms.
1980	*DSM-III*; Attention –Deficit Disorder (ADD). ADD with Hyperactivity. ADD without Hyperactivity.
1987	*DSM-III-R*; Attention-Deficit Hyperactivity Disorder. ADHD with levels of Severity Noted: Mild, Moderate, and Severe. Undifferentiated ADD.
1994	*DSM-IV*; Attention-Deficit/ Hyperactivity Disorder. ADHD: Combined Type. ADHD: Predominately Inattentive Type. ADHD: Predominately Hyperactive-Impulsive Type.

1.2.1.2 Definitions

Based on the American Psychiatric Association (2000) ADHD is characterized by persistent and developmentally inappropriate problems with attention, impulsivity, and hyperactivity that cause impairment in the individual's life and according to the American Academy of Pediatrics (2000), ADHD is the most common neurobehavioural disorder in childhood and it is among the most prevalent chronic health conditions affecting school-age children. Attention Deficit Hyperactivity Disorder (ADHD) and its symptoms are chronic and pervasive (Barkley, 2000). The behaviours occur in multiple settings, rather than just in one. Current research supports the idea of two distinct characteristics of ADHD, inattention and/or hyperactivity/impulsivity that may occur separately or be combined. As a result of this three subtypes have been identified: predominantly inattentive, predominantly hyperactive-impulsive and a combined type. However, inattention still remains as one of the characteristics of the hyperactive/impulsive subtype (ASHA, 1997 & ASHA, 2008). The Diagnostic and Statistical Manual Fourth Edition (DSM-IV, 1994) and the fourth edition, text revision (DSM-IV-TR, 2000) list nine symptoms for the inattention category (e.g., difficulty sustaining attention during tasks and play activities) and nine symptoms under the hyperactivity/impulsivity category (e.g., cannot sit still).

The DSM is the main diagnostic clinical tool for the diagnosis of ADHD in North America and the Middle East including Saudi Arabia. However the diagnostic scale that was developed by the World Health Organization (1993) i.e., ICD-10 (see Table 1.2) is used more in Europe (Mathers, 2007).

Table 1.2 ICD-10 criteria for diagnosing ADHD.

Adapted from ICD10: Classification of Mental and Behavioural Disorders (1992)

1. Inattention – At least six symptoms of attention have persisted for at least 6 months, to a degree that is maladaptive and inconsistent with the developmental level of the child:
Often fails to give close attention to details, or makes careless errors in schoolwork, work or other activities.
Often fails to sustain attention in tasks or play activities.
Often appears not to listen to what is being said to him or her.
Often fails to follow through on instructions or to finish school work, chores or duties in the workplace (not because of oppositional behaviour or failure to understand instructions).
Is often impaired in organizing tasks and activities.
Often avoids or strongly dislikes tasks, such as homework, that require sustained mental effort.
Often loses things necessary for certain tasks and activities, such as school assignments, pencils, books, toys or tools.
Is often easily distracted by external stimuli.
Is often forgetful in the course of daily activities.
2. Hyperactivity – At least three symptoms of hyperactivity have persisted for at least 6 months, to a degree that is maladaptive and inconsistent with the developmental level of the child:
Often fidgets with hands or feet or squirms on seat.
Often leaves seat in classroom or in other situations in which remaining seated is expected.
Often runs about or climbs excessively in situations in which it is inappropriate (in adolescents or adults, only feelings of restlessness may be present).
Is often unduly noisy in playing or has difficulty in engaging quietly in leisure activities.
Often exhibits a persistent pattern of excessive motor activity that is not substantially modified by social context or demands.
3. Impulsivity – At least one of the following symptoms of impulsivity has persisted for at least 6 months, to a degree that is maladaptive and inconsistent with the developmental level of the child:
Often blurts out answers before questions have been completed.

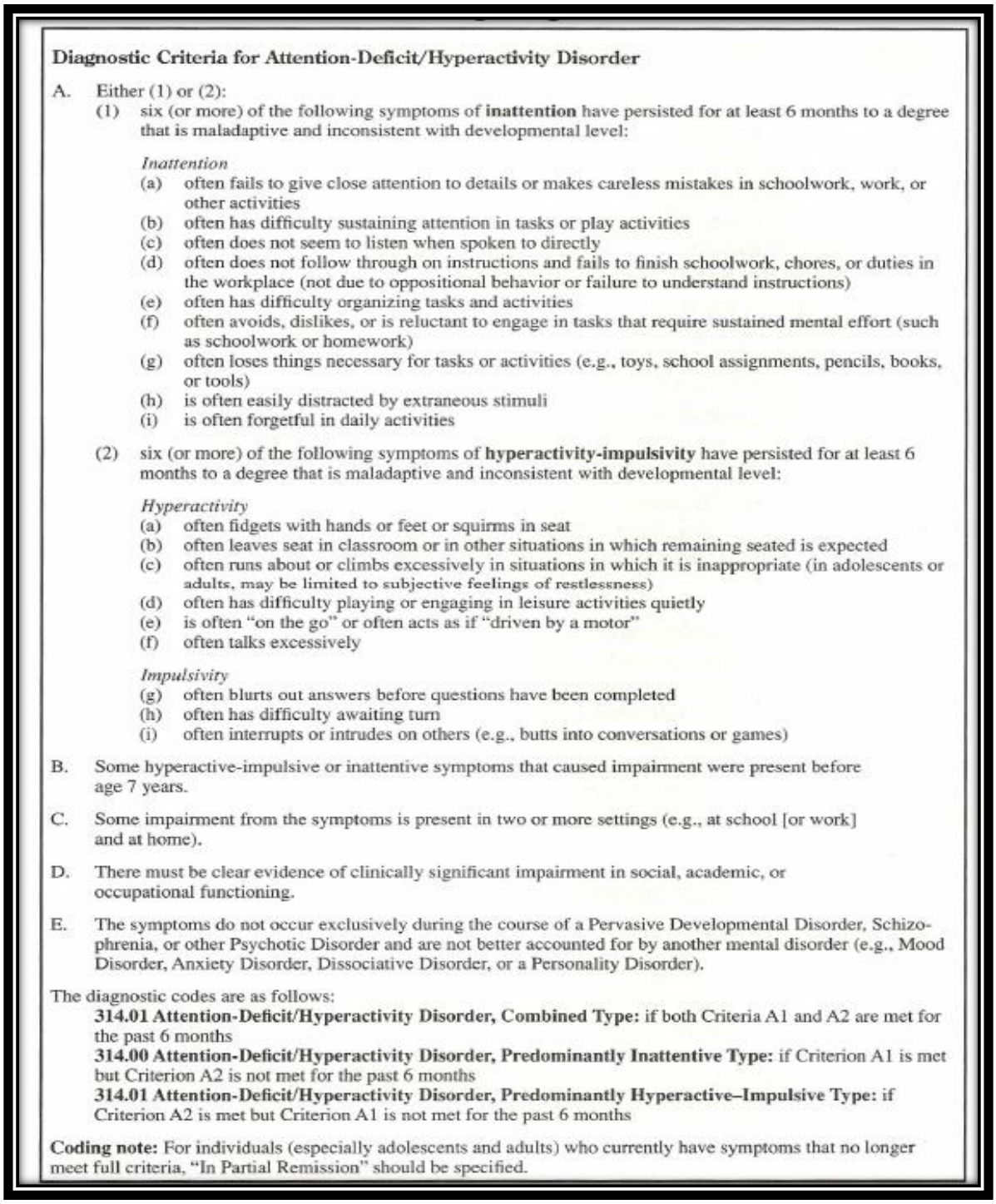
Often fails to wait in lines or await turns in games or group situations.
Often interrupts or intrudes on others (for example, butts into others' conversations or games).
Often talks excessively without appropriate response to social constraints.
4. Onset of the disorder is no later than the age of 7 years.
5. Pervasiveness – The criteria should be met for more than a single situation, for example, the combination of inattention and hyperactivity should be present both at home and at school, or at both school and another setting where children are observed, such as a clinic. (Evidence for cross-situationality will ordinarily require information from more than one source; parental reports about classroom behaviour, for instance, are unlikely to be sufficient.)
6. The symptoms in 1 and 3 cause clinically significant distress or impairment in social, academic or occupational functioning.

According to Tannock (1998) the differences between the DSM scale and the ICD-10 criteria include three dimensions as presented in table 1.2. Firstly, the focus on the main deficit (that includes inattention, hyperactivity and impulsivity): the ICD-10 requires all three types of symptoms to be present however the DSM classifies ADHD into subtypes based on the pattern of the symptoms' clusters. Secondly, the symptoms' pervasiveness: in the ICD-10, hyperactivity itself carries a risk for later development however in the DSM-IV the risk is thought to occur even with relatively mild and common degrees of severity of hyperactivity. Thirdly, comorbidities: the DSM views ADHD as a common but heterogeneous developmental disorder causing significant impairment but the ICD-10 claims that "the diagnosis of hyperkinetic syndrome is reserved for ADHD uncomplicated by comorbid psychopathology" (Tannock, 1998, p.66) however in the light of that conceptualization ADHD is relatively rare. In 2002 Karlovic, et al. concluded that the DSM IV identifies a broader group of children than the

ICD-10 in 409 elementary school children participants. According to the DSM-IV-TR, specific diagnostic criteria for Attention-Deficit Hyperactivity Disorder (ADHD) include developmentally inappropriate levels of inattention, impulsivity, and/or hyperactivity (See Figure 1.1).

Figure 1.1 DSM-IV-TR criteria for diagnosing ADHD.

Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (pp.92-93), by American Psychiatric Association, 2000.



Diagnostic Criteria for Attention-Deficit/Hyperactivity Disorder

A. Either (1) or (2):

(1) six (or more) of the following symptoms of **inattention** have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental level:

Inattention

(a) often fails to give close attention to details or makes careless mistakes in schoolwork, work, or other activities
(b) often has difficulty sustaining attention in tasks or play activities
(c) often does not seem to listen when spoken to directly
(d) often does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace (not due to oppositional behavior or failure to understand instructions)
(e) often has difficulty organizing tasks and activities
(f) often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort (such as schoolwork or homework)
(g) often loses things necessary for tasks or activities (e.g., toys, school assignments, pencils, books, or tools)
(h) is often easily distracted by extraneous stimuli
(i) is often forgetful in daily activities

(2) six (or more) of the following symptoms of **hyperactivity-impulsivity** have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental level:

Hyperactivity

(a) often fidgets with hands or feet or squirms in seat
(b) often leaves seat in classroom or in other situations in which remaining seated is expected
(c) often runs about or climbs excessively in situations in which it is inappropriate (in adolescents or adults, may be limited to subjective feelings of restlessness)
(d) often has difficulty playing or engaging in leisure activities quietly
(e) is often "on the go" or often acts as if "driven by a motor"
(f) often talks excessively

Impulsivity

(g) often blurts out answers before questions have been completed
(h) often has difficulty awaiting turn
(i) often interrupts or intrudes on others (e.g., butts into conversations or games)

B. Some hyperactive-impulsive or inattentive symptoms that caused impairment were present before age 7 years.

C. Some impairment from the symptoms is present in two or more settings (e.g., at school [or work] and at home).

D. There must be clear evidence of clinically significant impairment in social, academic, or occupational functioning.

E. The symptoms do not occur exclusively during the course of a Pervasive Developmental Disorder, Schizophrenia, or other Psychotic Disorder and are not better accounted for by another mental disorder (e.g., Mood Disorder, Anxiety Disorder, Dissociative Disorder, or a Personality Disorder).

The diagnostic codes are as follows:

314.01 Attention-Deficit/Hyperactivity Disorder, Combined Type: if both Criteria A1 and A2 are met for the past 6 months
314.00 Attention-Deficit/Hyperactivity Disorder, Predominantly Inattentive Type: if Criterion A1 is met but Criterion A2 is not met for the past 6 months
314.01 Attention-Deficit/Hyperactivity Disorder, Predominantly Hyperactive–Impulsive Type: if Criterion A2 is met but Criterion A1 is not met for the past 6 months

Coding note: For individuals (especially adolescents and adults) who currently have symptoms that no longer meet full criteria, "In Partial Remission" should be specified.

1.2.1.3 Future directions

At the time of writing this study, work is about to finish on the DSM-5. According to the American Psychiatric Association, DSM-5 Development (2012) the proposed changes for ADHD in the DSM-5 include:

a) Changing the age of onset from age 7 to onset of symptoms by age 12.
b) Changing subtypes to presentations and adding a fourth presentation for restrictive inattentive.
c) Changing the examples in the items but without changing their content in order to improve clarity and to accommodate a lifespan relevance of each symptom.
d) Removing pervasive developmental disorder (PDD) from the exclusion criteria.
e) Modifying the preamble in criteria A1 and A2 to indicate that information must be obtained from two different informants, preferably a parent and teacher in the case of children and a third party/significant other in cases of adults.
f) Adjusting the cut-off point for a diagnosis in adults (still under consideration).

All changes are aimed at increasing the validity of the diagnosis, but they may cause a significant increase in its prevalence.

1.2.1.4 Diagnostic considerations

Reviewing ADHD studies shows other assessment tools that have been used in addition to the different versions of the DSM to diagnose ADHD. These may be administered by psychiatrists, psychologists, teachers and sometimes parents. They include the child behaviour checklist (Redmond, 2004), the Attention-Deficit Hyperactivity Disorder Test (Kim & Kaiser, 2000), the Parent Interview for Child Symptoms-Revised and the Teacher Telephone Interview (Purvis & Tannock, 1997), the Swanson, Nolan, and Pelham Rating Scale (Humphries, et al., 1994), the Connors Abbreviated Teacher Rating Scale (Zentall, 1988), and the Connors Teacher Rating Scale (Humphries, et al., 1994; Landau & Milich, 1988). However, the previously mentioned tools are different in terms of the qualifications of the person who conducts the assessment and the techniques that are used for the assessment (i.e., interview, observation, and questionnaire) but they still provide valid information that facilitates diagnosing ADHD.

Diagnosing ADHD requires a comprehensive evaluation using multiple assessment methods and multiple informants (Barkley, 2010). A detailed analysis of all the available information is vital to reach an accurate diagnosis. Many experts believe that it is possible to identify 60-70% of children with ADHD by the age of two to three (Richard & Russell, 2001). The symptoms of ADHD can be present in a variety of educational, medical or behavioural disorders. Also, many individuals with ADHD have co-existing behavioural or emotional problems that require a thorough differential diagnosis (Weyandt, 2007).

1.2.2 Aetiology

It is currently acknowledged that the causes of ADHD are not fully known or understood and still attract controversy (Thapar, et al., 2013). Also, it is not linked to any single aetiology (Taylor, 2011 & Spencer, et al., 2002). However, there is strong evidence of a genetic link from studies carried out over the last thirty years which have shown that ADHD is more common in the biological relatives of children with ADHD than in the biological relatives of children who do not have ADHD (Willcut, 2012 & Tannock, 1998). For each child or adolescent diagnosed with ADHD, there is a 15-25% probability that one of his or her parents will have adult ADHD (Cohen, 1998). Faraone (2005) concluded the genetic contribution to observable phenotypic ADHD traits as being up to 76%. Li et al. (2006) claimed that DRD4 and DRD5 gene to be linked with ADHD. Asherson (2007) reported that a specific haplotype of the dopamine transporter gene has been associated with ADHD the combined type. The findings by Williams (2010) indicated an increased rate of chromosomal deletions in children with ADHD compared to those without ADHD which also suggests genetic influence in ADHD development.

The findings of structural imaging studies in ADHD showed signs of global maturational delay represented by reduced gray and white matter volumes and cortical thickness in ADHD in comparison to TD in childhood and adolescence (Vaidya, 2012, Williams, et al., 2010 & Shaw, et al., 2007). Also, the findings from functional imaging studies highlighted the abnormalities in multi loci that were not limited to frontal-striatal

circuitry but also included parietal, temporal and motor cortices, and cerebellum (Vaidya, 2012 & Durston, et al., 2007).

Collectively, genetic, heritability, neuroanatomical, neuroimaging, and neuropsychological studies point to a neurobiological basis of ADHD (Weyandt, 2007). Therefore, the proposed etiologies related to prenatal and perinatal risk factors, genetics, and neurobiological deficits may all contribute to the pathophysiology of ADHD in different individuals (Spencer, et al., 2002). Research has not supported many of the other suggested causes that are popular in the media (such as diet, food additives, sugar) (Rief, 2003).

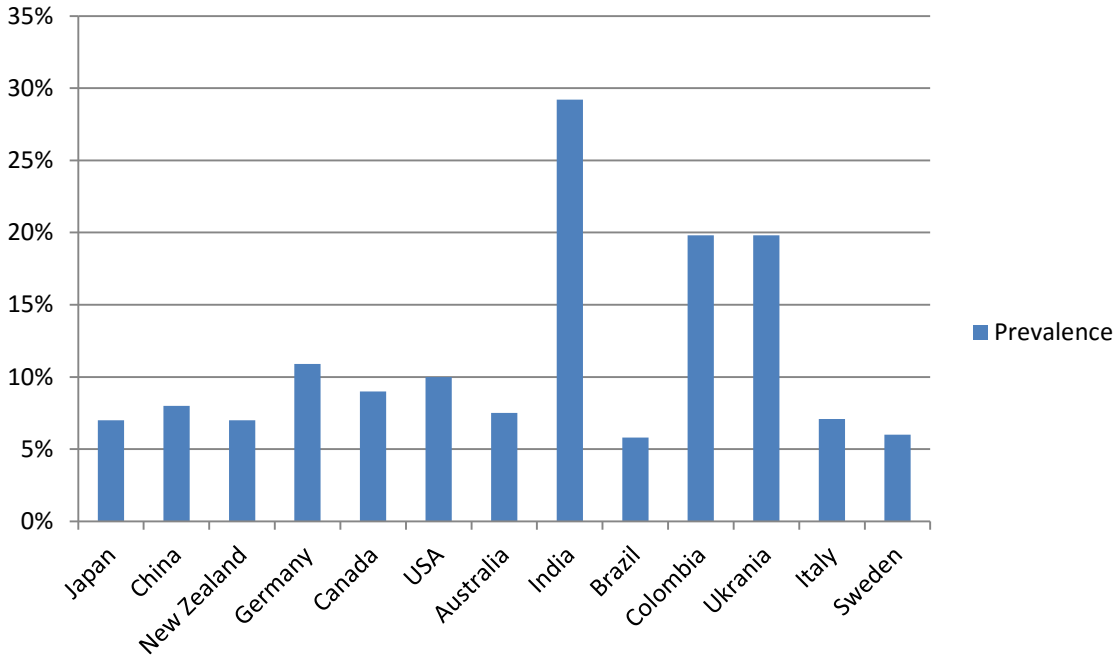
Based on Nigg (2012), the future directions in the research into the causes of ADHD can be highlighted in three themes. Firstly, more investigation of the effects of genetics is expected to help in mapping early environmental influences on the development of ADHD. Secondly, neurobiological findings need to be examined in the context of ethnic and cultural variations. Thirdly, more examination of the pattern and characterization of ADHD remains a major need. Overall, future research on the causes of ADHD will reflect new directions and scientific tools, which hopefully may help in revealing new insights into fundamental prevention.

1.2.3 Prevalence and gender of ADHD

The prevalence estimate of ADHD is as wide as 3%-10% (Richard & Russell, 2001; CDC 2010). The Center for Disease Control, CDC (2005) reported that 4.4 million

children aged 4-17 were reported to have a diagnosis of ADHD in 2003 in the United States or from 1.4 to 3 million school aged children in any given year (Barkley, 2006). Conner (2002) reported that the prevalence of ADHD symptoms in preschoolers in the United States varies from 2% to 59 % depending on whether community or clinic-referred children are studied. In the American adult population 4.4% of people have ADHD (Kessler, et al., 2006). ADHD occurs in all cultures and ethnic groups (see Figure 1.2); for example the prevalence of ADHD in Japan is 7%, in China is 6-8%, in New Zealand is 7% (Barkley, 2000) in Germany 10.9%, in Canada 9% in boys and 3.3% in girls, in Australia 7.5%, in India 29.2%, in Brazil 5.8%, in Colombia 19.8%, in Ukraine 19.8%, in Italy 7.1%, and in Sweden 6% (Weyandt, 2007). A review of fifty prevalence studies (including 20 US and non-US sample populations) suggested that the prevalence is similar in the two populations (Faraone et al., 2003). Skounti et al. (2007) claimed that the differences in prevalence rates most likely were the result of differences in the methodological approaches that were engaged, rather than reflecting inherent differences in the populations. Ethnicity may influence how parents, teachers, and practitioners perceive the symptoms of ADHD, which will have an impact on whether ADHD will be identified and treated appropriately or not (Rickel & Brown, 2007 & Brown, 2009).

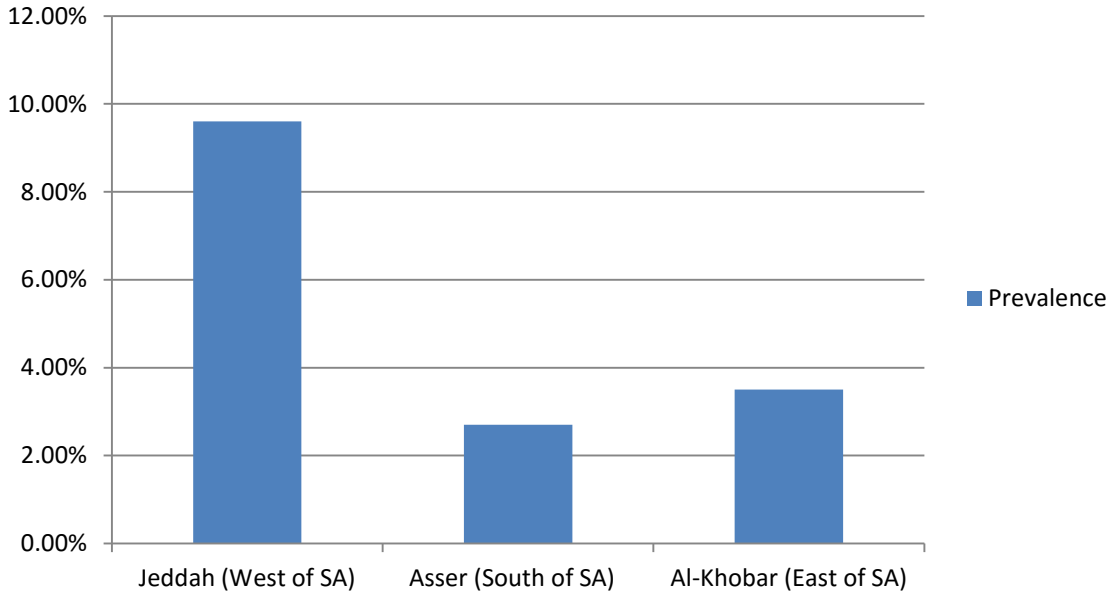
Figure 1.2 International prevalence of ADHD



Only three studies are available on the prevalence of the ADHD in Saudi Arabia. Figure 1.3 summarizes the findings of these studies, with respect to prevalence. In a study carried out by Al-Yami (1993) that collected data for 500 school age children (6-7 years old) from 10 elementary schools (5 schools were governmental and the other 5 were private) the results showed that the prevalence of ADHD in Saudi Arabia, specifically in the Jeddah region, was reported to be 9.6%. However, in a study by Alqahtani that collected data for 708 pupils (7-9 years old) from the Asser region, in the south of the Kingdom of Saudi Arabia, the results showed that the overall rate of ADHD was 2.7%, and in particular, the rate of attention types 2.0%, hyperactive/impulsivity type 1.4%, and combined type 0.7% (Alqahtani, 2010a and Alqahtani, 2010b). Finally, the results of Jenahi study (Jenahi et al., 2012), conducted on 1009 6-15 year-old female students in Al-Khobar Town, Eastern Saudi Arabia, showed the general prevalence of

ADHD was 3.5% and for inattention type 2.1% and 5.6% for hyperactive-impulsive type. Many factors contribute to the fluctuating percentages among ADHD prevalence studies. However, the generally accepted rate in children is 3% up to 7 % as reported by the American Psychiatric Association (2000).

Figure 1.3 The prevalence of ADHD in Saudi Arabia



According to the American Psychiatric Association (2000) the prevalence in males is higher than that in females; the ratio ranges from 2:1 to 9:1 depending on the subtype of ADHD. Carlson, Tamm, and Gaub (1997) investigated the ratio of males to females with ADHD and reported that males outnumber females by 3:1 in the general population and 6:1 in children referred to clinics. Although ADHD is more common in boys than in girls, the actual impact of ADHD can be more severe in girls (Rickel & Brown, 2007). Costello et al. (2005) conducted a survey in a general pediatric clinic

sample of 1,073 parents of preschool-age children ages two to five. The results showed that 5.1% of this general pediatric sample met the diagnostic criteria for ADHD and of these preschoolers with ADHD the hyperactive-impulsive subtype was the most common with 2.9%, followed by the combined type with 2.1%, in the inattentive subtype of ADHD was quite rare (0.1%).

1.2.4 ADHD onset and prognosis

Research findings indicate that ADHD is a lifelong condition that impacts an individual's educational, social and occupational life (Weyandt, 2007). In most instances the onset of ADHD characteristics is during early childhood years before the age of seven. The symptoms must last for at least six months and the effects have to be chronic (Richard & Russell, 2001). The onset of symptoms usually begins around three or four years of age (Barkley, Fischer, Edelbrock, & Smallish, 1990). Brown (2009) and more recently Wichstrøm et al. (2012) suggested that the ADHD is increasingly diagnosed in the preschool years, with symptoms and impairment emerging as early as ages two and three. ADHD symptoms persist across the lifespan, with estimates of 50-65% of children with ADHD continuing to experience severe symptoms and related impairment into adulthood (Barkley, 2010). 80% of children with ADHD continue to have substantial symptoms into adolescence and 67% continue to exhibit symptoms into adulthood (Rief, 2003). The prognosis for ADHD when treated is positive and encouraging. However, the prognosis is variable if it is not treated. Without intervention children with ADHD are at risk for social, emotional, behavioural, and academic problems; however, with

intervention most children with ADHD will be able to successfully manage the disorder. (Barkley, 2000; Dendy, 2000; Reif, 2003; Russell & Richard 2001; Weyandt, 2007; Brown, 2009).

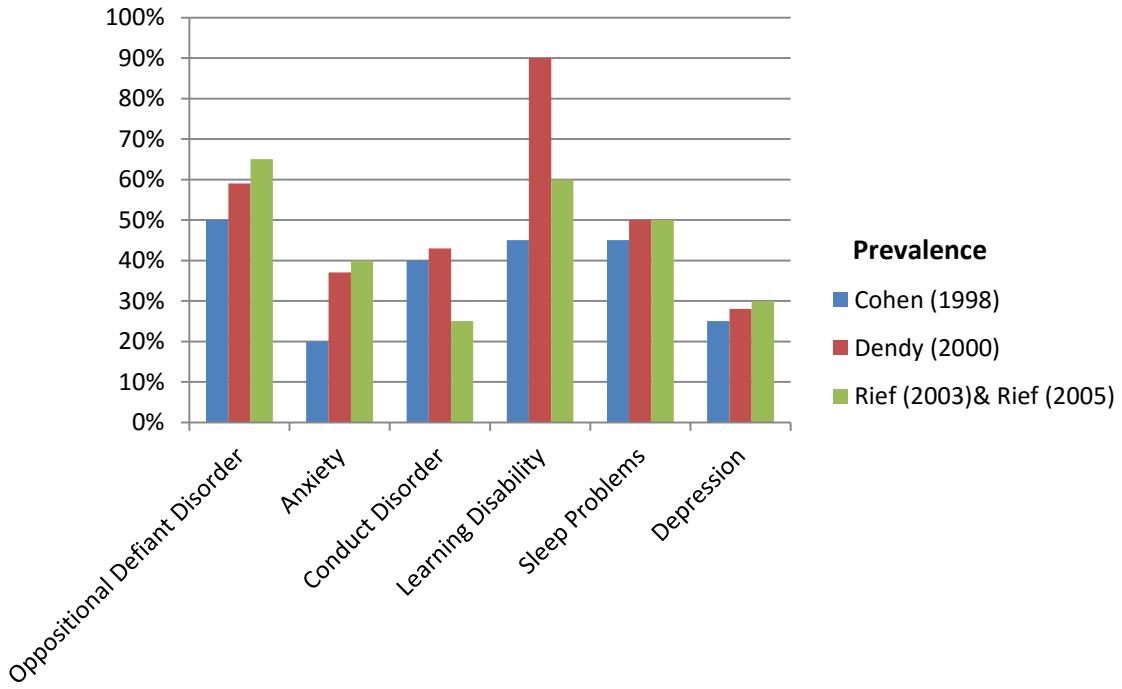
1.2.5 Comorbidity

In addition to the core symptoms of ADHD, the disorder is complicated by a range of comorbid conditions. ADHD and the rate of comorbidity are still the focus of a number of research projects in different fields (see Figure 1.4). Brown (2009) reported that only 34% of children with ADHD have 'pure' ADHD, compared with 64% with a comorbid condition. In a multimodal treatment study of children with ADHD (Barkley, 2006) researchers found that two-thirds of children with ADHD have an additional coexisting disorder. More recently, Brown (2009) reviewed the association between ADHD and comorbid clinical conditions, and suggested that the presentation of symptoms in children with ADHD more likely resembles a cluster of conditions rather than a single clinical entity. Many of the symptoms associated with ADHD can also be symptoms of other problems (e.g., anxiety, conduct disorders, depression, and learning disability). Due to the wide variety of disorders that can be mistaken for ADHD or that can coexist with ADHD, it is always essential for a child to be carefully evaluated.

The most common coexisting disorders with ADHD are oppositional defiant disorder, conduct disorder, anxiety disorder, depression and learning disability (see Figure 1.4). The British child and adolescent mental health survey about comorbidity between ADHD and conduct problems concluded that 26% of those with oppositional defiant disorder (ODD) and 27% of those with conduct disorder (CD) also are eligible for

the a diagnosis of ADHD. At the same time more than 50% of those with diagnosis of ADHD had a comorbid behaviour disorder (Ford et al., 2003). Also, ADHD shows a wide variety of comorbidity with other problems (Willcutt et al., 2012). There are well-established strong associations with speech and language problems, specific learning and developmental problems, intellectual disability, motor coordination difficulties and autistic spectrum disorders (Thapar et al., 2013). Brown (2009) reported high rates of communication disorders in children with ADHD (see section 1.3 for more details).

Figure 1.4 Prevalence of certain comorbidities with ADHD



According to Connor et al. (2003), the early age at onset of ADHD symptoms as well as severity were both associated with higher instances of comorbid conditions.

Also, the identification of comorbid disorders associated with ADHD can contribute to more accurate diagnosis and foster optimal treatment and perhaps better prognosis.

1.2.6 ADHD in Saudi Arabia

Currently, there is no information on the nature of any pragmatic aspects for Arabic speakers with ADHD. However, there have been a few studies of the prevalence of ADHD in Kingdom of Saudi Arabia that were generally consistent with the findings of the international studies (as described in section 1.2.3 above). The main association that organizes and promotes ADHD services and awareness in the Kingdom of Saudi Arabia is the ADHD society and support group (AFTA). It was established in 2004. AFTA aims to improve the lives of children with ADHD and their families through nationwide awareness and education campaigns and the improvement of treatment support services. AFTA endeavors to provide every parent, teacher, and caregiver in the Kingdom of Saudi Arabia with access to the most recent information on ADHD symptoms, advice about getting diagnosed, and techniques for ADHD management. AFTA organize several public and scientific events annually (http://adhd.org.sa).

As far as the author is aware, there are no published studies on the pragmatic aspects of ADHD in Saudi Arabia. This could be due to two main factors: firstly, the number of trained and qualified speech-language pathologists is quite small and secondly, the history of service provision for children with special needs in general is comparatively recent.

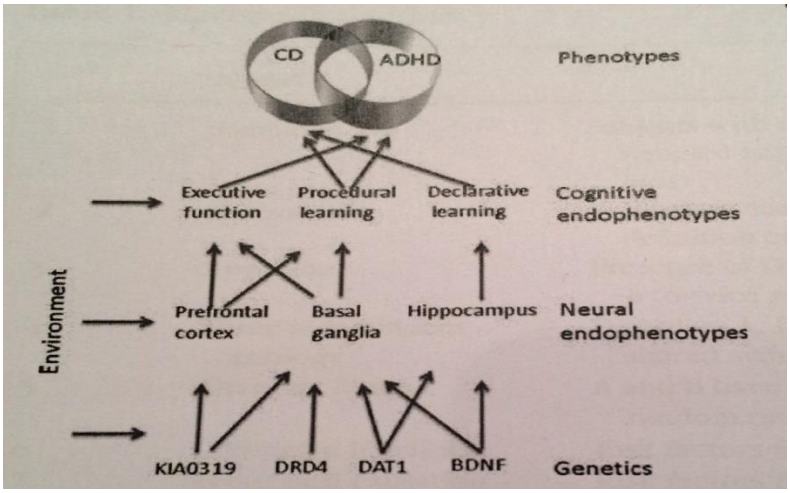
1.3 Speech and language disorders in ADHD

Although speech and language disorders are not among the fundamental features or required to fulfill the diagnostic criteria for ADHD, several research studies revealed a high prevalence of communication disorders among children with ADHD (Geurts & Embrechts, 2008; Nilsen et al., 2013). The evidence from the literature suggests that inattention, hyperactivity and impulsivity have their effects on different speech and language skills; 17 to 38% of children diagnosed with speech and language disorders also have ADHD (ASHA, 1997 & ASHA, 2008). The American Speech Language Hearing Association (2008) claimed that co-occurring ADHD and speech and language disorders represent a frequently encountered challenge for school-based speech-language pathologists and other practitioners. Also, it is not uncommon to find that children with speech and language disorders are also being treated for ADHD (Tomblin and Mueller, 2012). Bruce et al. (2006) reported that many of the children in their study group had been referred to a speech-language pathologist in their early preschool years which they used as evidence to suggest that children with ADHD are somewhat delayed in developing language skills compared to children without ADHD. However we need to consider that reported rates vary by referral source, makeup of the assessment protocol, and the criteria for language impairments that were used (Timler, 2014; Tomblin and Mueller, 2012)

Baker and Cantwell (1992) studied a sample of 65 3-16 year olds who had been clinically diagnosed with ADHD; they found that 17% had speech impairment, 22% had language impairment and 61% had a speech and language impairment. Also, Beitchman

et al. (1989) studied a sample of 17 clinical subjects who were attending kindergarten; they concluded that 76% had some form of speech and language impairment. The speech and language problems emerged as an early indicator for ADHD in toddlers, preschool, and kindergarten years (Rief, 2003). Tomblin and Mueller (2012) provide a background for the comorbidity of ADHD and speech and language disorders (See Figure 1.5). They discussed the relationships between the communication disorders and the ADHD features that exist at the symptom level which they call the *phenotype* and the underlying systems that are associated with, or are the cause of these symptoms. In figure 1.5 they show how the same underlying systems can provide an explanation for the symptoms of communication disorders and ADHD and also for the comorbidity that exists between the two disorders. The authors concluded, when disorders share common symptoms "it is arguable that they may provide a clearer picture of the basis of comorbidity than the symptoms themselves" (Tomblin and Mueller, 2012, p.199).

Figure 1.5 A hypothetical etiological scheme demonstrating shared etiologies at multiple levels resulting in comorbidity between ADHD and communication disorders (CD) (Tomblin & Mueller, 2012, Figure 1, p.199)



ADHD diagnoses have been long associated with language difficulties in children, supported by evidence from several studies. Tirosh and Cohen (1998) studied a sample of 3,208 participants aged 6-11years in a clinical setting; they reported that 45% had a combined ADHD diagnosis and a language deficit. Also, Trautman el al. (1990) reported that 68.2% of 67 children with a confirmed ADHD diagnosis had a language disorder as well. This is consistent with the results of the study by Gualtieri et al. (1983) that reported 90% of 26 children with ADHD (age range 5-13) had language disorder and the study by Warr-Leeper et al. (1994) that reported 80% with ADHD had previously undiagnosed language disorders. Regarding school aged children Tannock et al. (1995) reported that 60% of ADHD school age children had language disorders as well. Also, it is important to mention that several studies concluded that the probability of children with ADHD having a diagnosis of language disorder is higher than children without ADHD, such as Cantwell, Baker, and Mattison, 1979,1981; Love and Thompson, 1988; Trautman, Giddan, and Jurs, 1990. Furthermore, Cohen et al. (1998) found that children who had been previously identified with language disorders were more likely subsequently to be identified as ADHD than children without language disorders. DaParma et al. (2011) used a sample of 100 children with ADHD (ages 6-16) to investigate the prevalence of receptive and expressive language disorders. The results revealed that children with ADHD exhibited receptive language difficulties at the receptive measures with (12-21%) and expressive language difficulties at the expressive measures with (10-16%). In receptive difficulties, the children with ADHD had problems with following directions, understanding spoken language, and understanding grammatical relationships. In expressive difficulties, the children with ADHD had

problems with sentence formulation, recalling words rapidly, and performing word association tasks. Children with ADHD are more likely to have delayed onset of language acquisition, compared to their age equivalent peers in terms of the appearance of the first words and using shorter sentences (6-35% of ADHD versus 2-6% in the general population) (Hartsough & Lambert, 1985; Szatmari, Offord, & Boyle, 1989; and Gross-Tsur, Shalevm, & Amir, 1991). However the findings were not always consistent (Barkely, Du Paul, & McMurray 1990). When compared to typically developing children, children with ADHD have been shown to be at increased risk for several markers of language impairment including: verbal behaviour (Zentall, 1988), delayed onset of first words and word combinations (Szatmari, Offord, & Boyle, 1989), poor performance on standardized tests (vocabulary, syntax, reading fluency and short term memory), disruptive speech, discourse limitations in producing cohesive narratives and pragmatic difficulties associated with inappropriate conversational participation (Timler, 2014; Cohen et al., 1998; Tirosh and Cohen, 1998; Purvis and Tannock, 1997; Love and Thompson, 1988). Also, there is evidence to suggest how parents perceive their children with ADHD as having communication difficulties that is presented by Bruce et al. (2006). They found parents of children with ADHD rated their children's problems at the receptive level as three times worse than their expressive difficulties. Al-Haidar collected data from 416 patients (all under 19 years old) who attended the child psychiatric outpatient clinic at King Khalid University Hospital, Riyadh, Saudi Arabia. He found that 106 (25.5%) were diagnosed with ADHD and that 28.3% of the ADHD patients had presented with coexistent expressive language disorder (Al-Haidar, 2003). It is difficult to make generalizations about the prevalence of language difficulties in

children with ADHD, because of the methodological variations of the studies discussed in this section (i.e., functional analysis and/or formal language testing tools).

Academic learning is usually negatively affected by a delay in acquiring language skills, especially the attention problems exhibited by children with ADHD (Richard & Russell, 2001). Epidemiological studies using standardized language test batteries suggest that significant levels of language impairment can be expected to co-occur in 35–50% of children who present with ADHD symptoms and rates of up to 90% have been observed in studies using clinically referred samples (Tannock and Schachar, 1996). Many students with ADHD exhibit language learning problems at the discourse level (ASHA, 1997; ASHA, 2008).

1.3.1 The role of the speech-language pathologist with ADHD

According to the American Speech-Language-Hearing Association (ASHA) position statement (1997), the speech-language pathologist is often among the first to evaluate children suspected of having ADHD. Speech-language pathologists play a vital role in the assessment, diagnosis, and treatment of people of all ages with ADHD. They serve as evaluators, educational program designers, collaborative consultants with classroom teachers, consultants to other disciplines, and primary interventionists facilitating the development of language and learning strategies in children and adolescents with ADHD. More recently, the American Academy of Pediatrics, recommended that the best practice guidelines should include the assessment for other

conditions that might coexist with ADHD containing developmental disorders such as speech and language disorders (American Academy of Pediatrics, Subcommittee on ADHD, Steering Committee on Quality Improvement and Management, 2011)

1.3.2 Speech and language services in Saudi Arabia

The field of speech and language pathology in Saudi Arabia is in its infancy; therefore, service programs for individuals with speech and language difficulties and impairment are rarely found and if they are found they generally focus on diagnostic needs, rather than providing the required intervention program, especially in the governmental hospital sector. It is very important to mention that as far as the author is aware no insurance companies cover speech-language pathology services in Kingdom of Saudi Arabia, which means all patients who need to get speech-language pathology services must pay for everything themselves. However, all speech-language pathology services that are provided by the governmental sector are free of charge. The government of Saudi Arabia oversees most of these services through three authorities; The Ministry of Health, The Ministry of Education and The Ministry of Social Affairs. Speech and language pathology is provided through the main governmental hospitals and recently a few private hospitals and specialized clinics where there are a few speech-language pathologists (SLP) who are required to provide the services to in-patients (hospital setting) and out-patients of all ages. Given the number of referrals this is mainly limited to diagnostic services. However, some services exist in specialized governmental schools

such as The School for Mentally Challenged Children “Al Tarbia Al-Fikria” where one SLP or sometimes two are employed. Similarly, at the Al-Amal Institute for the Deaf and Hearing Impaired, usually only one or at the most two speech-language pathologists serve the entire school population. It is important to note that these specialized schools are usually located in the main cities of the Kingdom of Saudi Arabia (i.e., Makkah, Madinah, Riyadh, Jeddah, and Alkhobar). On the other hand, outside the main cities there is very limited access to Speech and Language Pathology services. Also, it is very important to point out that there are no intervention programs for the zero to five-year-old children in these schools, since they only provide services to children above the age of five years until high school. There is a very limited number of private specialized speech and language clinics and centers in the Kingdom of Saudi Arabia, which can provide services to all individuals with various communication disorders.

1.4 Language and language disorders

Language is a socially shared code or conventional system that represents ideas through the use of arbitrary symbols and rules that govern combinations of these symbols (Bernstein & Tiegerman-Farber, 2002). Language has been usefully described as having three levels: “Form”, “Content” and “Use”. In this approach, “Form” is described as including phonology, morphology, and syntax; “Content” describes semantics and “Use” describes pragmatics (Bloom & Lahey, 1978; Hoff, 2001). During early child development years, if one or more of these levels does not develop properly for any reason, the language will be considered disordered (Tomblin, et al., 1997).

Children acquire language naturally without formal instruction however some children experience difficulties in their acquisition that vary in severity. These children are typically described as language disordered (Bernstein & Tiegerman-Farber, 2002). It is important to have a clear distinction between language delay versus disordered language. Nicolosi et al. (2004) defined language delay as the failure to comprehend or produce language at the expected age that may be due to slow maturation. Regarding language disorder, it is described by Accardo and Whitman (2002) as a developmental disorder involving disabilities of reception integration, recall, and/or production of language. According to the ICD-10, language expression and comprehension disorder is described as assessed on a standardized test, within the 2 standard deviation limit for the child's age. Added to that, the DSM-IV-TR describes the language disorder as defined by the scores obtained from standardized, individually administered measures of expressive language development. These will be substantially below those obtained from standardized measures of both nonverbal intellectual capacity and receptive language development. The DSM uses two classifications to describe language disorder: first expressive language disorder and secondly, mixed receptive-expressive language disorder, in recognition of the fact that receptive language problems rarely occur in isolation without accompanying expressive problems (Brown, 2009). Language disorder may include impaired comprehension and/or expression in the use of spoken but also extended to, written and/or other symbol systems (Bernstein & Tiegerman-Farber, 2002; Owens, 2009). The disorder may involve (1) the form of language (phonology, morphology, and syntax), (2) the content of language (semantics), and/or (3) the function of language in communication (pragmatics) in any combination.

The main focus of work on communication disorders among children with and without ADHD has been in the area of language impairment (Leonard et al., 2011). Language impairments and ADHD are two common developmental disorders that have shown high rates of co-occurrence (Mueller & Tomblin, 2012). It is important to consider that research on ADHD language is of two types: research studies that focus on ADHD as a whole and research directed at either of two ADHD groups (with and without language impairment). Also we need to note the three ADHD subtypes were not always considered. The results of previous studies have suggested the range of co-occurrence of language disorders and ADHD could be as wide as 45-90% in children (as has been discussed before in section 1.3). The literature on studying language disorders in children with ADHD has generally focused on the areas of receptive and expressive language difficulties. Receptive language difficulties often include comprehension difficulties, difficulty remembering lengthy materials and difficulties in understanding main ideas (DaParma et al., 2011). Expressive language problems usually include difficulty in formulating age-appropriate sentences (Oram et al., 1999), misusing pronouns, producing confused conversation and difficulty expressing emotions (Geffner, 2006). According to Timler (2014) children with ADHD demonstrate diverse language profiles but generally score below their TD peers in expressive sentence formulation and receptive inferencing tasks even when comorbid language impairment has been ruled out. The Timler (2014) findings are consistent with Staikova et al., (2013) that concluded children with ADHD exhibited poorer pragmatic language skills relative to TD peers across all measures, even after controlling for general language abilities. As reported by

Bruce et al., 2006, the language disorders are “closely associated with the core aspects of the ADHD symptoms” (Bruce et al., 2006, p.59).

1.5 Pragmatics and pragmatic disorders

After reviewing the speech-language pathology journals and the conferences of the last three decades this author found the words “Pragmatic” and “Pragmatic Disorders” have become increasingly important. Pragmatic issues are being increasingly addressed in clinical practice. This has led to a growing number of studies that are concerned with difficulties and problems some children may experience at the level of language use (Al-Dakroury, Hewlett, Watson, & Gardner, 2010). However, the relationship between pragmatic theory and clinical practice is not as strong as it should be compared to practice in syntax and semantics, according to Perkins, (2007). With such heightened interest and research activity there is a great need for more and more efforts to increase our understanding of pragmatics in different diagnostic categories.

According to Nilsen et al., (2013) successful communication requires more than knowledge of words and grammar; it requires an understanding of how language is used for social and functional purposes. Gleason (2005) defined it as the system of rules that dictates the way language is used to accomplish social ends and Silverman (2003) to the ability of a speaker to use language for accomplishing goals or intentions while interacting with others. (Mey, 2001; Owens, 2009; & McKibbin & Hegde, 2011) add the concept of inappropriacy. Their definition of pragmatics includes who is talking to whom, in which way [how], in what situation [where] and at what time [when]

(Roseberry-McKibbin & Hegde, 2011). Pragmatics is commonly divided into three domains; firstly, discourse management that includes how to initiate, maintain and end a conversation, secondly communicative intention that includes how to request and inform, and thirdly presupposition that includes assumptions about the interlocutor and the context (Fujiki & Brinton, 2009; Geurts et al., 2008). The child's pragmatic competency is associated with a group of developing skills including eye contact, requesting information, taking turns in conversations, topic initiation, topic maintenance, speech acts, adjusting what is being said according to the listener's linguistic ability, responding to requests for clarification and cohesion. Children with poor pragmatic skills often misinterpret another person's communicative intent and have difficulty responding appropriately either verbally or nonverbally (Brown. 2009). In 1987, Prutting and Kirchner described pragmatic aspects of language as including verbal utterances, paralinguistic aspects, and nonverbal behaviours. According to Prutting and Kirchner (1987), the nonverbal aspect of pragmatic skills include eye contact, facial expression, physical proximity and gestures; paralinguistic pragmatic skills are defined as the mechanics of speaking that include intensity, intelligibility, tone, and rhythm (considering the conversational impact of these characteristics). A possible exemplifying scenario for a disruption on the nonverbal level in the pragmatic domain would be when a conversation is disrupted due to the child's failure to give eye contact with the interlocutor during conversation which may mean the topic of the conversation is shifted to the child's inappropriate behaviours instead of the subject in hand. Verbal pragmatic deficits may include inappropriate turn taking (e.g., not responding to the interlocutor), interruptions, and failure to track and respond to topic shifts. Camarata and Gibson

(1999) conclude that pragmatic deficits are evident when disruptions occur at a level that significantly interferes with the child's ability to successfully converse. Pragmatic disorder is a descriptive term that refers to difficulties with using language to convey and understand intended meaning and it includes any disruptions in the social interaction that do not arise from deficits in structural aspects of language (Camarata & Gibson, 1999; Adams, 2002; Adams & Lloyed, 2005), although a lack of structural complexity can lead to pragmatic ambiguity (Perkins 2010). So pragmatic difficulties can be observed as a secondary feature of any developmental language impairment due to the limitation in communication abilities (Prutting & Kirchner, 1987; Bishop & Leonard , 2000) however developmental pragmatic disorders are not restricted to any particular diagnosis such as ADHD (Adams, 2002). Pragmatic disorders are evident when disruptions occur at the level of language that significantly interfere with the individual's ability to successfully converse (Lahey, 1988; Miller, 1981). These levels include: verbal linguistic behaviours including speech act, topic initiation, topic maintenance, topic shifting, turn taking, lexical (word) selection, and stylistic variations; paralinguistic aspects including the mechanics of speaking including intelligibility, vocal quality, intensity (loudness), prosody, and fluency; and nonverbal aspects including eye contact and body language (Camarata & Gibson, 1999; Cantwell & Baker, 1987; Prutting & Kirchner, 1987). The DSM-IV (1994) and the DSM-IV-TR (2000) include language disorders under a broader category of communication disorders, which are defined as any disorder in the production and/or comprehension of speech and/or language. It should be noted that the pragmatic aspect of language is not directly included but is indicated in the expressive language difficulty description (315.31) by pointing out that language difficulty interferes with

social communication. Camarata and Gibson (1999) stated that "the DSM criteria appear to require pragmatic analysis for accurate diagnosis" (Camarata and Gibson, 1999, p.210).

1.5.1 Formalists versus functionalists in speech-language pathology

The formalists view pragmatics as one of five equal and interrelated aspects of language (Owens, 2009). These aspects are syntax, morphology, phonology, semantics and pragmatics that are organized and controlled by a set of formal systems and rules (Cattell, 2000). Prutting (1982) argued that this approach is inadequate. In contrast, the functionalistic point of view is a more holistic approach that views pragmatics as an overall organization of these aspects of language (Owens, 2009).

Prutting (1982) discussed the shift that had taken place in speech-language pathology, as result of the focus on the pragmatic aspects of language. The discussion of the formalists and functionalists illustrated the differences in definition, function of language, competency, and framework. At the level of definition, the formalist approach was described as referring to a linguistic view of language while the functionalist approach referred to the pragmatic perspective. Added to that the advocates of the formalist approach defined language as a set of sentences whereas the functionalists advocated defining language as an instrument for social interaction. At the level of language function, the formalists view it, as mainly the expression of thoughts, however the functionalists believe the primary function of language is communication, which the author believes is more practical for clinical purposes. At the level of competency, the

formalists view it as the ability to produce, comprehend, and judge grammatical structures; however the functionalists see competency as a communicative competence, which is rooted in social interaction.

From a clinical perspective Owens (2009) mentioned that speech-language pathologists replaced the formalists' model with a more functionalistic approach due to the increasing recognition (by speech-language pathologists) of the influence of pragmatics on the structure and content of verbal output. This view of language led to a different approach for intervention; from the approach that covers isolated bits of language (entity approach) to the holistic approach (functionalistic approach) that targets language within the overall communication process (Norris & Hoffman, 1990).

Figure 1.6 The Formalists see pragmatics as one of five equal and interrelated aspects of language (adapted from Owens, 2009).

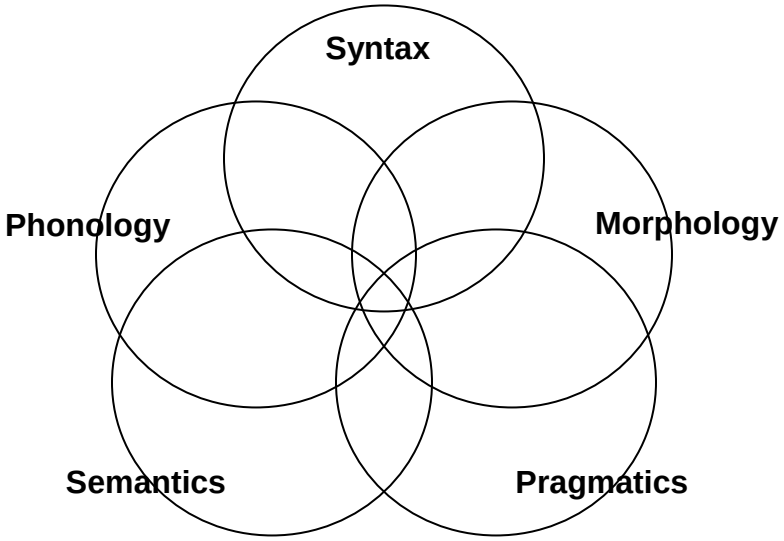
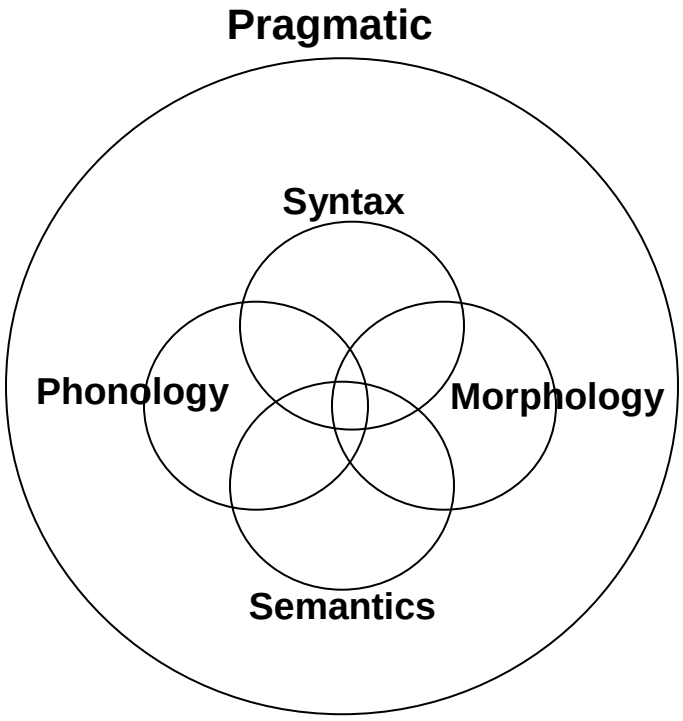


Figure 1.7 The Functionalist sees pragmatics as the overall organizing aspect of language (adapted from Owens, 2009).



1.5.2 Pragmatic disorder in ADHD

Language disorders are common in ADHD with accumulating evidence from several research studies on pragmatic language difficulties (Green et al., 2014; Staikova et al., 2013). Although research has examined many important aspects of language and ADHD, there have been relatively few studies that have looked at the critical aspects of the child with ADHD's ability to communicate effectively (McInnes et al., 2003; Rennie, 2003). Those few studies have demonstrated that children with ADHD are reported to have significantly greater pragmatic communication difficulties compared to their peers (Nilsen et al., 2013) such as Bishop and Baird (2001) that found the parents of children with ADHD reported that their children demonstrate more difficulties with conversation and social relationships than TD children. Geurts et al. (2010) provided a brief review of five questionnaire based studies that referred to pragmatic language difficulties in ADHD and that were published by 2010 (four of these studies used the Checklist of Communicative Competence, devised by Bishop (CCC, 1998 and revised version CCC-2, 2003). They concluded those five studies formed a small but consistent body of evidence that children with ADHD have pragmatic difficulties compared to typically developing peers.

According to Staikova et al. (2013) social functioning impairment has been linked to the ADHD symptoms. In harmony with Staikova et al.'s conclusion, Green et al. (2014) in their review of the research work to date claimed a consistent profile of pragmatic language impairment in children with ADHD. The nature of attention deficit hyperactivity disorder (ADHD) as described in the DSM-IV and the ICD-10 indicates a

potential association with language disorders, and the DSM-IV (1994) and the DSM-IV-TR (2000) diagnostic criteria for ADHD imply that it is a pragmatic language disorder characterized by talking excessively, interrupting others, difficulty waiting on turns, not listening to what is being said and blurting out answers to questions before they have been completed. Other criteria include auditory/language processing deficits and discourse deficits e.g. managing topic in conversation (Russell, 2007; Richard & Russell, 2001). According to Redmond (2011), children's social difficulties may arise because of limited verbal narrative skills in the children with ADHD.

In the light of the previously discussed relationship between ADHD (see sections 1.3, 1.4, and 1.5) and pragmatic difficulties we need to discuss the potential impact of ADHD on the pragmatic aspects of language acquisition. The three main theories of language development are the behaviourist/learned theory, the psycholinguistic/innate theory, and the interactionist/transactional theory (as cited in Gleason, 2005). The interactionist/transactional theory emphasizes the social or pragmatic function of language development. Camarata and Yoder (2002) define transaction developing interactions where it is evident the adult interlocutor and the child affect one another. Aspects of the child's productions during interacting with a parent will prompt specific classes of responses from the parent and vice versa, so that parent responses are associated with language advances in the child. For that reason the child is required to initiate, respond, and maintain adequate attention in order to activate the transactional process which may be disrupted at several points in a conversational interaction with a child with ADHD symptoms because of the importance of mutual attention. Camarata &

Gibson, (1999) claim that a child with hyperactive and impulsive type may experience greater risk for disrupting language learning transactions.

Bignell and Cain (2007) suggest children with ADHD may experience pragmatic difficulties because they may arise from cognitive deficits underlying behavioural symptoms of ADHD. For instance pragmatic language taps executive skills like planning and monitoring behaviours. Executive function can be defined as high-level neurocognitive processes involved in goal-directed behaviour and it is an umbrella term to refer to such processes that maintain an appropriate problem-solving to attain delayed goals (Willcutt et al., 2005). Booth et al. (2013) described the executive functions as the higher order processes that direct thought and action. Green et al. (2014) in their review (1979 to present) concluded that the evidence for pragmatic language difficulties in children with ADHD is consistent with the executive function deficit characterizes ADHD. They stated "As yet there is very little empirical evidence of specific relationships between particular aspects of pragmatic language and particular domains of executive function."(Green et al., 2014, p.15). Barkley (1997) has suggested executive functions can be split into measures of (a) nonverbal working memory; (b) verbal working memory; (c) self-regulation; and (d) reconstitution. So, in order to hold a coherent reciprocal conversation one needs to pay attention to and remember what one's conversational partner is saying, which relies on the executive functions of sustained attention and working memory (Geurts et al., 2010). Inattention may lead to children missing important conversational and contextual cues, limiting their ability to learn that words may have multiple meanings according to the context in which they are used. At

the same time, one needs to inhibit excessive talking; and to ensure that one's contributions are relevant, which relies on the executive functions of response inhibition and planning (Tannock and Schachar, 1996). Green et al. (2014) concluded in their review that even with the theoretical relationships between pragmatic language disorder and executive function deficit, there has been very little empirical work steered towards considering these potential relationships with respect to ADHD.

It is further suggested that inattention characteristic of the ADHD could have a direct impact on the verbal aspects of pragmatics more than the nonverbal aspects of pragmatics (Camarata & Gibson 1999). Verbal aspects include turn taking, amount of talk, and topic initiation, maintenance and changes (Prutting & Kirchner, 1987), these will usually impact the flow of a conversation. Research assessing the pragmatic characteristics of children with ADHD and language learning disability has indicated that these children might exhibit problems with turn taking, answering questions or requesting clarification and in initiating or maintaining a conversation (Owens, 2009). Camarata and Gibson (1999) reviewed outcomes in previous studies which suggested that pragmatic difficulties lead to behavioural and social difficulties that impeded further age appropriate language development, regardless of subtype of ADHD.

In support of this finding Kim and Kaiser (2000) investigated language characteristics of ADHD (11 participants) and TD (11 participants) ages 6-8 years in terms of semantic, syntactic and pragmatic language skills. Their results revealed that children with ADHD who produced more inappropriate pragmatic behaviours had lower

abilities in spoken language during free play. Kim and Kaiser elaborated that children with ADHD often did not respond to questions or requests from the speaker, interrupted/overlapped others, gave less feedback to the speaker and they used nonspecific vocabulary.

More recently Bignell and Cain (2007) studied pragmatic aspects of communication and language comprehension in relation to poor attention, high hyperactivity and a combination of poor attention and hyperactivity in non-diagnosed children (age range 7-11 year old). Three groups were formed: children with poor attention (inattention type), children with high hyperactivity (hyperactive type) and children with poor attention and high hyperactivity (combined type). Their performance as reported by their classroom teacher was compared with TD (same-age controls). The researchers concluded that the inattention type group and the combined type group were impaired in both their comprehension of figurative language and in pragmatic aspects of communication. The hyperactivity type group was impaired in their comprehension of figurative language, but they did not exhibit communication impairments. This research extended work with clinical populations of children with ADHD to a non-diagnosed sample of children. It showed that poor attention and elevated levels of hyperactivity are associated with pragmatic language weaknesses. Continuing with the same approach, Leonard et al. (2011) studied the role of pragmatic language use in mediating the relation between hyperactivity and inattention and social skills problems in a community sample of 54 children aged 9-11 years with varying levels of hyperactivity and inattention. They found that pragmatic language use fully mediated the relation between hyperactivity and

social skills problems and partially mediated the relation between inattention and social skills problems. However it is important to highlight that, these findings may be described as limited since they were based only on parent ratings to assess both pragmatic language and social skills. Another limitation in Leonard et al., (2011) and Bignell & Cain (2007) studies was that they selected children with elevated levels of parent-rated inattention and hyperactivity instead of carefully diagnosed subjects with ADHD based on psychiatric assessment as in the current study.

According to Tannock (2002) and Tannock and Scharchar (1996) the pragmatic deficits that are associated with ADHD include "1) excessive verbal output during spontaneous conversations, during task transitions, and in play settings, 2) decreased verbal output and more dysfluencies when confronted with tasks that require planning and organization of verbal responses, as in story retelling or when giving directions, 3) difficulties in introducing, maintaining, and changing topics appropriately and in negotiating smooth interchanges or turn taking during conversation, 4) problems in being specific, accurate and concise in the selection and use of words to convey information in an unambiguous manner, and 5) difficulties in adjusting language to the listener and specific context."(p.138). Ketalaars et al. (2010), found a high negative correlation between pragmatic competence and hyperactivity in a community sample of 4-year-old children, claiming that early assessment of pragmatic competence may lead to early detection of ADHD. Finally, based on our clinical experience, we predict that pragmatic difficulties would commonly be found in children with ADHD.

1.5.3 Pragmatic assessment

The assessment of pragmatics is a central issue in the evaluation of children with communication disorders in general (Owens, 2009; Adams, 2002). The main objective for pragmatic assessment is to identify the strengths and weaknesses of the child's pragmatic capabilities (McTear & Conti-Ramsden, 1992; Owens, 2009; Adams, 2002). According to Norbury (2014) pragmatic language abilities are particularly difficult to measure using standardized tests due to the nature of contextually dependent behaviours that occur in dyadic exchange. Pragmatic abilities can be assessed through description of problematic areas, compared to what is expected in typically developing children (see Table 1.3) but the knowledge of developmental norms is limited, which means that only very approximate ages can be provided (Adams, 2002). It is important to mention that pragmatic performance is affected by the styles of communication, which emerge in early childhood (Hewitt, 2000) and the pragmatic functions vary according to context and audience (Perkins, 2007). So, pragmatic assessment is quite distinct from language assessment methods for TD children, in which norms can be derived from standardized tests given on one occasion (Adams, 2002).

Table 1.3 ***The development of language pragmatics in typical children: a summary of some research studies (adopted from Adams, 2002)***
*Ages given should be considered as approximations only and not development norms

Pragmatic Behaviours	**Approximate Emergence ***
Pre-verbal turn taking	*8-9 months*
Pre-verbal communicative intentions/proto-words	*12 months*
Rapid development of communicative acts	*14-32 months*
Turn taking	*stabilizes at 2;6-3;6*
Can maintain topic in interaction with adult	*from 2 years*
Making clarifications	*from 2 years*
Adaptation of speech style to listener	*from 2 years*
Use of early polite forms	*variable from 2 years*
Response to non-specific requests for repetition	*2 years*
Range of communication acts achieved	*3-4 years*
Infers information from story	*3-4 years*
Infers indirect meanings	*4-6 years*
Turn-taking repairs	*5 years*
Gaps in interaction decline	*5 years*
Reports thematic narrative with plot	*5-7 years*
Metapragmatic skills present	*6-7 years*
Mastery of discourse makers	*7 years*
Skilled use of anaphoric reference	*6-7 years*
Information adequacy complete	*9 years*
Polite forms fully developed	*from 9 years*
Cohesion and reference errors decrease	*9-12 years*
Explanation of idioms	*Up to 17 years*

Pragmatic abilities can be assessed via several published standardized tests which are in common use and have pragmatic elements, such as the Assessment of Comprehension and Expression (age range 6-11 years old) (Adams, et al., 2001), the Clinical Evaluation of Language Fundamentals (Semel, Wiig, & Secord, 2000) and the Test of Language Competence (Wiig & Secord, 1989). These tests are not devoted to the assessment of pragmatics alone but they contain subtests that are devoted to pragmatic assessment. The Test of Pragmatic Language (TOPL) (Phelps-Terasaki &

Phelps-Gunn, 1992) is the only test that is dedicated entirely to the assessment of pragmatic language skills.

The Test of Pragmatic Language (TOPL) is a formal norm-referenced instrument, which is targeted at language on demand, as opposed to spontaneous language. TOPL elicits functional communicative interactions by using scenarios from common settings. Participants are shown pictures and read brief stories describing a social interaction and then asked questions that involved making inferences about the story. The TOPL has been used previously in research to examine the pragmatic ability of children with and without a diagnosis of ADHD, for example the study by Kim and Kaiser (2000) revealed that there were no differences between children with ADHD and typically developing peers when assessed by the TOPL. However when the Pragmatic Protocol (Prutting & Kirchner, 1987) was used with the same subjects the results showed that the children with ADHD demonstrated less appropriate pragmatic behaviours during conversations with adult partners. The inconsistencies which resulted from the use of different assessment tests may reflect the distinction between linguistic competence (pragmatic knowledge) and communicative competence (pragmatic performance) which has been mentioned by the authors of the TOPL test. Also, Adams (2002) argues that such formal testing measures are unlikely to reveal an accurate or comprehensive picture of the child's pragmatic competence in more dynamic, context dependent communicative exchanges.

Furthermore, pragmatic abilities can be assessed through checklists, protocols, and questionnaires of pragmatic behaviours, which are used to avoid the problem of lack

of normative data. Speech-language pathologists and practitioners commonly use checklists more than tests (Adams, 2002). The Prutting's Pragmatic Protocol is a very influential work in language pragmatics assessment (Prutting & Kirchner, 1987). The protocol is a descriptive classification of 30 pragmatic parameters (e.g., variety of speech acts, topic selection, topic introduction, topic maintenance) that are rated according to whether they are used 'appropriately' or 'inappropriately' or 'not observed'.

An alternative approach is to assess the presence of language pragmatic problems via observation, as in the Children's Communication Checklist-2 CCC-2 (Bishop, 2003) which is perhaps the most widely used checklist in clinical practice and research (Norbury, 2014). The children's communication checklist aims to differentiate children with pragmatic language impairment from other types of language impairments. The CCC-2 is a seventeen item questionnaire designed to assess children's communication skills in various areas of language including pragmatics. CCC-2 provides standard scores for ten scales (speech, syntax, semantics, coherence, initiation, stereotyped language, use of context, nonverbal communication, social relationships, and interests). Four of them focus on verbal and nonverbal pragmatic skills (inattention, coherence, scripted language, and context). Normative data on children aged 4 to 15 years are available on over 500 participants from UK and over 900 participants from US. Also, CCC-2 has been translated into different languages (Norbury, 2014). The reliability of the CCC-2 was examined in children aged 4 to 15 years of age and parents served as informants. The internal consistency ranged from 0.66 to 0.80 and the inter-rater reliability between parents and teachers ranged from 0.16 to 0.53 (Bishop, 2003). It is important to highlight

that the CCC-2 does not provide a diagnosis but it can be used to 'signpost aspects of communication' as described by (Norbury, 2014, p.207) for further assessment decisions. Added to that, the parents and teachers may wish to rate the child's communicative behaviour directly rather than via clinicians or researchers.

Formal testing of pragmatics has a limited usefulness for typical pragmatic abnormalities during interaction, however it plays a significant role in the assessment of comprehension of pragmatic intent. Using elicitation of communicative intent through a naturalistic approach is vital in the assessment of pragmatic skills of pre-school children (Adams, 2002). After reviewing the literature it is fair to say that assessment via naturalistic observation is preferred among researchers since it reflects typical contextual functioning, however it can be judged as being too time consuming (Adams, 2002). The assessment of pragmatic skills contributes heavily to communication and social intervention strategies for children with ADHD (Camarata & Gibson, 1999).

1.6 Pragmatic verbal behaviours.

In summary, verbal behaviours in children with ADHD are critical in elucidating the nature of communication differences in ADHD. This study focuses on four verbal pragmatic skills: quantity of verbal output, turns, topic initiation and topic maintenance. We need to have clear definitions of 'verbal output', 'turn', 'topic' and 'interlocutor' in order to understand the amount of verbal output, interlocutor impact, turn taking, topic initiation, topic maintenance, and ratio of topic initiation to topic maintenance.

1.6.1 Verbal output

The quantity of verbal output in children has been investigated in various studies for different purposes (see table 1.4 for a summary of verbal productivity studies**)**. According to Miller (1991) the total number of words produced during an interaction period in typically developing children increases steadily with age and can be considered as a general measure of verbal productivity. Zentall (1988) concluded that the total number of words can be used as the best representation for the quantity of verbal output (verbal productivity). The DSM criteria include the amount of verbal output as a possible symptom of ADHD. Tannock (2002) claims that the quantity of verbal output is one of the pragmatic difficulties in children with ADHD. Different research studies have adopted different methodological approaches to study the verbal output in children with ADHD in terms of quantity parameters. For example the total number of words as in Zentall (1988); the total number of utterances as in Barkley, Cunningham, and Karlsson (1983), Purvis and Tannock (2000), and Zentall (1988); and the mean length of utterances in morphemes, as in Redmond (2004). It is important to note that the vast majority of empirical research that aimed to study the quantity of verbal output in children with ADHD was all carried out between 1979 and 1997. Since that time researchers have tended to rely on this research, rather than conducting their own studies. The Diagnostic and Statistical Manual Fourth Edition (DSM-IV, 1994) and the fourth edition, text revision (DSM-IV-TR, 2000) stated that the child with ADHD "Often talks excessively". No restrictions were placed on the statement either on the setting or the interlocutor. The DSM-IV makes no attempt to support this statement with references,

however the following studies seem to support it: Copeland (1979); Barkley et al. (1983); Zentall et al. (1983); and Zentall (1988).

Copeland (1979) studied the types and the amount of 'private speech' during free play for 16 hyperactive and 16 nonhyperactive boys (the mean age was 8.5 years), by allowing the subjects to play alone in a room without any instruction about the activity for three minutes. The results revealed that hyperactive boys talk more than nonhyperactive ones. The measure of "number of verbalizations" was defined as "a word, phrase, or sentence that was independent from the preceding and following one in meaning and/or time" (Copeland, 1979: p.172). The period (during which the subjects were recorded) was very short, but Copeland believed it was enough to provide information about the verbalization profile of her subjects. It is important to mention that Copeland's study can be judged as influential since it has been used as a reference by many subsequent studies that investigated the amount of verbal output in children with ADHD. However none of these studies questioned its methodology, especially the short free play time.

Barkley et al. (1983) studied verbal output in ADHD by comparing 18 participants with ADHD with 18 TD boys (the mean age was 9.25 years) during 15 minutes free play and 15 minutes of "task periods" with their mothers. The results showed that participants with ADHD produced significantly more utterances than TD participants during free play and there were no notable differences in mean length of

utterance between the ADHD and the TD subjects. However the results for the structured task periods showed no significant differences between the groups in the means for the mothers or their children on any of the dependent measures. It is important to mention that the main purpose of this study was to compare the speech of children with ADHD interacting with their mothers before and after medication with a stimulant drug (methylphenidate). In a second part of the study, Barkley and his colleagues examined the effects of a stimulant drug on the language of 12 of these participants with ADHD in both free play and structured tasks in a drug-placebo crossover design. Drug treatment was associated with declines in the frequency but not the complexity of utterances in both hyperactive boys and their mothers in both situations (free play and task periods).

Zentall et al. (1983) investigated the verbal output in children with ADHD by comparing them with TD children. The research subjects were 13 participants with ADHD and 13 TD boys aged 3:10 to 7:5 years old, selected based on high (14 to 29) and low (0 to 9) ratings on the Conners Abbreviated Teacher Questionnaire (ATRS). All children were administered three forms of the referential communication task, using procedures, tasks, and a task order based on the referential communication task that was developed by Glucksberg, Krauss, and Weisberg in 1966. All verbalizations of each child for each task were assessed using different language measures such as number of words, number of sentences, and mean length of sentence. The results revealed that children with ADHD were more verbal than TD children in all tasks. Also the children with ADHD spoke more than TD children during transition periods.

Zentall (1988) studied the difference in verbal output during elicited conditions (storytelling) and non-elicited conditions (transitions between tasks) in 22 children with ADHD and 22 TD children (the mean age was 9.25 years). All data was collected via interaction with an examiner. The results revealed that the ADHD group was more talkative during the non-elicited conditions, which means during transitions between activities i.e., when they were not asked to talk but less talkative during elicited conditions, particularly during organization and planning activities (e.g. storytelling) when they were asked to tell stories.

Tannock, Purvis, and Schachar (1993) studied the narrative abilities of children with ADHD (30 boys aged 7-11 years) versus TD, matched in age and sex. Tannock and her colleagues concluded that the participants with ADHD produced significantly fewer units (a unit was defined as one which contained an idea) and less information overall than the TD boys' group, which they counted as evidence of a production deficit in the children with ADHD. Also, the children with ADHD's stories were more poorly organized and less cohesive and contained more inaccuracies. Accordingly, they judged the children with ADHD's stories as often confused and hard to follow. They concluded that these results were caused by an underlying deficit in executive processes.

Another study by Purvis and Tannock (1997) investigated the language abilities in children with ADHD, children with reading disabilities, children with both ADHD and reading disabilities and TD children. Participants were asked to recall a lengthy narrative and knowledge of semantic aspects of their language in tests were assessed. The study

was conducted with 50 boys (14 ADHD, 14 ADHD and reading disability, 8 reading disability only, and 14 TD) with an age range of 7-11 years. The results revealed that the children with ADHD produced less of what they called “verbal production” than TD, although this was a measure of the number of “idea units”. Purvis and Tannock concluded that ADHD deficits were consistent with higher-order executive function deficits.

Tannock in 2002 and Tannock and Scharchar in 1996, concluded that in the quantity of the verbal output in children with ADHD, there are two patterns: “1) excessive verbal output during spontaneous conversations, during task transitions, and in play settings, 2) decreased verbal output and more dysfluencies when confronted with tasks that require planning and organization of verbal responses, as in story retelling or when giving directions” (p. 138). This has become the established and accepted view. Brown (2009) completely agreed with Tannock’s description and Perkins (2007) used Tannock’s exact words when commenting on the quality of verbal output of children with ADHD.

The author of the current study believes that considering Tannock and her colleagues (1993) and Purvis and Tannock’s (1997) research findings as evidence of either reduced verbal output in children with ADHD during formal communication tasks or increased output in informal situations is misleading, since they counted the number of idea units, not the actual quantity of verbal output. It is logically possible, for example, that a greater number of "idea units" could be associated with lower verbal output as measured in number of words spoken.

Table 1.4 Summary of verbal productivity studies.

Study	Subjects and Age Range	Sitting and Procedures	Findings
Copeland (1979)	16 hyperactive and 16 nonhyperactive participants (the mean age is 8.50 years).	'Private speech' during free play (alone) for three minutes.	Hyperactive participants are talking more than nonhyperactive.
Barkley et al. (1983)	18 participants with ADHD and 18 TD participants (mean age is 9.25 years).	Verbal output in ADHD during 15 minutes free play and 15 minutes task periods with their mothers.	Participants with ADHD produced significantly more utterances than TD participants during free play only.
Zentall et al. (1983)	13 participants with ADHD and 13 TD participants' ages 3:10 to 7:5 year old.	Administered three forms of the referential communication task with examiner to study verbal output in ADHD.	Children with ADHD were more verbal than TD children in all tasks.
Zentall (1988)	22 children with ADHD and 22 TD children (mean age is 9.25 years).	The difference in the verbal output during elicited conditions (storytelling) and nonelicited conditions (transitions between tasks) during interaction with an examiner.	ADHD group more talkative during nonelicited condition but less talkative during elicited conditions.
Tannock, Purvis, and Schachar (1993)	Children with ADHD (30 boys aged 7-11 years) versus TD that matched in age and sex.	Narrative abilities in children with ADHD during interaction with an examiner.	Participants with ADHD produced significantly fewer units and less information overall than TD group.
Purvis and Tannock (1997)	50 boys (14 ADHD, 14 ADHD and reading disability, 8 reading disability, and 14 TD) with age range of 7-11 years.	Investigated the language abilities in children with ADHD, reading disabilities, and TD.	Participants with ADHD produced less of what they called "verbal production" than TD participants.

This author decided to hypothesise that the verbal output of children with ADHD aged 4-5 years would be lower than that of typically developing children of similar age. On the one hand, the evidence from previous research in favour of greater talkativeness on the part of children with ADHD is not nearly as strong as might be thought from reading the confident assertion about the talkativeness of children with ADHD in the DSM manual; on the other hand, my opinion to the contrary, based on observation, my own clinical experience and reports to me by parents, was supported by other clinical language professionals with whom I discussed the issue.

The only direct research evidence concerning the number of words produced by children with ADHD compared with typically developing children comes from four of the studies described above (see also Table 1.4): Copeland (1979), Barkley et al. (1983), Zentall et al. (1983) and Zentall (1988). All the studies are at least 25 years old and in one case (Copeland 1979) the speech recorded was private monologue, which seems an unusual mode for children of around the age of 8.5 years. Zentall et al. (1983) collected data during formal communication tasks and found children with ADHD to talk more than typically developing children. This result was not supported by Zentall (1988), who found that children with ADHD talked significantly less than typically developing children during formal communication tasks, although they talked significantly more during free play. This pattern agrees with the findings of Barkley (1983) to the extent that the latter, too, found that children with ADHD talked significantly more during free play, though they did not do so during formal communication tasks. Taken together, the

outcomes of these research studies do not amount to a clear or uniform answer to the question of differential verbal output of ADHD and typically developing children.

Over 23 years working as a speech pathologist in Saudi Arabia, I treated many children with ADHD who were brought to me by parents who reported to me that the child had language problems. No parents ever reported excessive talking as part of the problem. In 2010, when I attended the ASHA conference in Philadelphia, USA, I discussed the issue with some American colleagues. One who had extensive experience of treating children with ADHD expressed the strong opinion that these children had reduced verbal output. I would also argue that the findings of Andreou et al. (2005) lend some indirect support for this view. They found that children with ADHD had significantly lower scores on all the WISC-III verbal scales. I have not encountered a child with low scores on these scales who also seems to be abnormally talkative and it seems to me very unlikely.

1.6.2 Turns

In most cultures only one person speaks at a time. Yielding the right to speak or the 'floor' to the next speaker formally establishes a turn. According to Stivers et al., (2009), when adults converse, they observe a convention of ‘one speaker at a time’. When one speaker’s turn ends the other begins; the transition time is minimized with little resulting overlap in speech. Craig and Evans, (1991) described children’s spontaneous conversation as mostly involving only one child speaking at a time even

though turn size is not predetermined. Bernstein and Tiegerman-Farber (2002) defined a turn as any single communicative act, verbal or nonverbal, that is directed toward another person. Sacks (1995) defined a turn as the shift in the direction of the speaking 'flow', that is characteristic of normal conversation. Sacks' definition is adopted by this researcher as useful for the current study.

Allocating turns between speakers is where turn taking mechanisms come into the picture (Mey, 2001). Turn taking is crucial for conversation to take place and it involves the ability of a child to integrate pragmatic and linguistic knowledge (McTear & Conti-Ramsden, 1992). The first speaker's utterance or turn is referred to as an initiation and the second speaker's turn will constitute a next turn. Ervin-Tripp (1979) mentioned in her chapter titled "Children's verbal turn-taking" that children at the age of two can maintain topic during interaction with an adult and show competency at turn-taking repairs by the age of five. Also, Klecan-Aker and Swank (1988) examined the use of language functions in a structured setting in normal preschool children. The researchers interviewed 240 preschoolers aged 2 to 5 using toys and pictures and elicited eight language functions: labeling, description, revision, affirmation/negation, personal information, requesting, greetings, and turn taking. The researchers found that appropriate responses increased with age and targeted language functions were in most preschoolers' repertoire by 3.5 years. Bedrosian et al. (1988) investigated conversational turn-taking violations and corresponding repair mechanisms in mother-child interaction. 30 mother-child dyads, with TD children (age range from 34-75 months) were videotaped in a 10-minute free play situation. The interactions were analyzed for several aspects of

overlaps (i.e. simultaneous talking), including general characteristics, participant involvement, turn-taking repair mechanisms, topic characteristics, and communicative intent. The results revealed 246 overlaps; the majority was single and nonconsecutive. It was noted that the mothers interrupted significantly more than the children. In terms of repair mechanisms, children exhibited a greater frequency of discontinuation of talking when the mothers interrupted than the mothers for comparable situations. Both within and following the majority of overlaps, mothers and children maintained the same topic. Utterances consisting of informative statements were interrupted more often than those consisting of requests. The overlapping talk of children with ADHD however has been less investigated.

Conversational competence requires paying attention to what the partner says, and making appropriate replies, which is arguably one of the core problems in ADHD. Ervin-Tripp (1979) wrote that the incompetent speaker would not gaze at or orient to partners, would display random gaps and overlaps in conversation, and would talk about objects and thoughts on a whim without any regard to what has been said. According to Kim and Kaiser's (2000) research study they concluded that children with ADHD produce more inappropriate pragmatic behaviours than TD children at the level of absence of response to questions or requests, overlap and interruption during conversation, less feedback to the speaker, unspecific vocabulary use and lack of cohesion. The ADHD DSM-IV-TR diagnostic criteria (included earlier in Figure 1.1) imply difficulty waiting on turns as one of the main symptoms. The specific criteria for impulsivity include "g) often blurts out answers before questions have been completed; h) often has difficulty awaiting turn; i)

often interrupts or intrudes on others". Tannock et al. (1993) and Tannock (2002) mentioned that the pragmatic problems in children with ADHD include difficulties in the appropriate timing and quantity of language within social and learning contexts. Kim and Kaiser (2000) reported problematic behaviours that were associated with language use in children with ADHD compared to TD children, which includes interrupting and overlapping speech. It is important to establish output in Arabic speaking children with ADHD, in order to find out how their verbal productivity is distributed across the conversational turns by studying the average number of words per turn.

1.6.3 Topic

Topic as an aspect of pragmatic language skills has been defined by Bedrosian (1988) as the proposition or set of propositions or subject matter about which the speaker is either providing or requesting new information. According to Brinton, et al. (1997) "topic concerns what speakers talk about as well as how they manage the flow of content within their interactions" (p.3). The latter description was found useful in the analysis of topic in the current study and Brinton el al. (1997) reported that topic manipulation skills may be at risk in clinical populations. Bedrosian (1993) mentioned that "Topic is critical to how one is perceived as communicator" (p.38).

Based on Stech (1982), a conversation is organized into topic sequences and the speaker's manipulation of topic helps to arrange groups of utterances into conversational segments. According to Owens (2009), to initiate a conversation efficiently, one should

begin by getting the listener's attention with a greeting and/or eye contact followed by a clearly stated topic for conversation. After the first person in the conversation has introduced the topic, the partner will either accept the topic by adopting and commenting on it, or reject the topic by changing it, or ending the conversation. Owens adds that opening and closing a conversation is one of the frequently observed pragmatic problems in a language impaired child. To initiate a topic, preschoolers and those with language impairments depend on nonlinguistic cues such as pointing and holding the partner's hand. However, mature speakers will clearly name the topic of conversation (Owens, 2009). Once a topic is initiated, the speakers keep the topic open and each sentence used adds new information to the topic. Bloom and Lahey (1978) mentioned that preschool children maintain the topic of an adult utterance by imitating part of the adult's utterance or by adding new related information. Keenan and Schieffelin (1976) considered the topic maintained if the topic in the following utterance matches that of its predecessor exactly or if the topic in the following utterance borrows some proposition from the topics of the immediately preceding utterance and/or adds or requests new information about that topic. Added to that they considered the topic changed if a new topic is introduced or a previous but not immediately preceding topic is reintroduced. According to Schober-Peterson and Johnson (1989) several previous studies reported "children as young as 3.5 to 4 years of age are able to initiate and maintain verbal exchanges" (p. 857).

Brinton and Fujiki (1984) investigated the manipulation of discourse topic in spontaneous conversation in three age groups (5-6 year olds, 9-10 year olds and adults).

None of the subjects had been identified as speech, language, or hearing impaired, nor were they receiving any remedial services in academic areas. The results revealed that the number of topics introduced and reintroduced in the sampling period decreased with age, whereas the proportion of topics maintained increased with age. Added to that, subjects maintained topics for longer sequences of utterances with increasing age. In Brinton and Fujiki's study, it was mentioned that the average number of topics that a 5 year old TD child can discuss is 50 during a 15 minute period and they can maintain a topic for an average of five utterances. Brinton and Fujiki concluded that it may be impossible to identify disordered patterns of conversation in children of this age because normally developing 5-year-olds are not very skilled at sustaining topics of conversation. It is very important to note that the study report did not provide enough details of specifications or play setting or toys that had been used.

Wanaska et al. (1986) reported that play materials seem to have a significant effect on the topic performance of preschool children. Wanaska and her colleagues investigated the type of topic initiators used by preschoolers during different play situations. The results revealed that the different play situations elicited different types of topic initiators (for example, the hospital set situations elicited a greater frequency of here-and-now topics compared to playing with Lego).

A child with pragmatic impairment usually has limited topics or perseverates on a few topics regardless of the context (Owens, 2009). This conversational behaviour could be due to limited language concepts and limited vocabulary, which could impede the

child from continuing with the targeted conversational topic. Although children with ADHD are often characterized as at risk of language disorders, "very little information exists regarding the conversation production of these children" (Redmond, 2004, p.108), which is still a valid statement (at the time of writing). The DSM mentions a set of verbal behaviours as a part of the ADHD diagnostic criteria, (See Figure 1.1 for more details). Camarata and Gibson (1999) argue that all aspects of topic use (introduction, maintenance, and change) are inadequate in children with ADHD. Brinton and Fujiki (1984) state that the children may not introduce a new topic adequately for reasons of limited attention span, distractibility or a failure to grasp the point of the preceding utterance.

In Humphries et al. (1994) teachers identified language functioning problems of 95 boys (aged 6.5–13.8 years) in three groups: one group with ADHD, one with learning disabilities, and one control group with average achievement in school. Children with ADHD problems were rated as having significantly more pragmatic problems, manifested as a difficulty in maintaining a conversation, but not in initiating a conversation. Tannock and Schachar (1993) mentioned pragmatic problems in children with ADHD which include difficulties in the appropriate timing and quantity of language within social and learning contexts.

If there is reduced verbal output in children with ADHD, it may affect the amount of topic initiation and topic maintenance behaviours. The author decided to compare ratio of topic initiation to topic maintenance between children with ADHD and TD children, rather than compare the amount of topic initiations and topic maintenance as separate

phenomena to avoid the possible difference in the amount of verbal output between participants with ADHD and TD participants. The following research question was investigated, is the ratio of topic initiation to topic maintenance in children with ADHD higher than in typically developing children matched in age and gender?

1.6.4 Interlocutor impact

The interlocutor is a person that takes part in a conversation. The interlocutor can be considered as part of the context of a conversation. According to Ervin-Tripp (2000) the familiarity of interlocutor is one of the main contextual influences. Adams's research review (2002) concluded that context is the main factor in informal language sampling specifically in pragmatics. Also, Hoff (2010) reported that "the evidence of context effects comes from several different research traditions, however the literature does not provide a unified picture of the nature of context or of their underlying process" (Hoff, 2010, p. 461).

According to Bornstein et al. (2000) TD 2-year-old children produce more speech and use a more varied vocabulary in talking to their mothers than to a researcher, and that can be explained by children's sensitivity to the support their mothers provide. Hoff (2003) found that during mother-child interaction the 4-year-old children of college-educated mothers used richer vocabularies than 4-year-olds with high school-educated mothers. However, these same children showed no group differences in the richness of the vocabularies they used when producing narratives for the researcher.

Hoff (2010) investigated the effects of contextual variables on children's language use in conversation by conducting two studies. In the first study, 20 TD children between the ages of 1.5 and 2.2 were studied in dyadic conversation with their mothers in three settings: mealtime, toy play, and book reading. The findings that emerged from this study included: "a) the richness of the vocabulary that the children used and the relatedness of their speech to the speech of their conversational partner differed depending on the context of the conversation and b) the number of utterances produced and the grammatical complexity of the children's speech did not differ as a function of setting" (Hoff, 2010, p.466). The second study investigated the differences in speech produced by 16 TD children between the ages of 1.9 and 3.0 in dyadic conversation with three different conversational partners: a sibling between the ages of 4 and 5 years, another sibling between the ages of 7 and 8 years, and their mother. The study included a test of the effects of this contextual variable on the average verbal output, lexical richness, grammatical complexity, and discourse coherence. The results showed that a) the children used a richer vocabulary and produced more responses to questions in conversation with their mothers than with their older siblings; b) children produced more word types in conversation with their mothers than in conversation with both siblings; and c) Mean length of utterance (MLU) was (surprisingly) significantly lower in speech to the mother than in the speech to the younger siblings. This is somewhat inconsistent with the pattern of other findings, but it may reflect the higher frequency of single-word responses to questions during the interaction with the mothers.

Scott and Taylor (1978) examined the influence of the sampling conditions (clinical setting with clinician and home setting with mother) in 3-6 year-old TD children and found the older children were more influenced by sampling conditions than the younger children. 4-year-olds speak differently to conversational partners of different ages, using syntactically more complex speech when talking to an adult than when talking to a 2-year-old child (Hoff, 2010).

To study the verbal interaction in children with ADHD researchers have used different formats such as child-mother interaction (e.g., Barkley et al., 1983) and child-examiner interaction (e.g., Zentall, 1988) and in addition child-only "private speech" (e.g., Copeland, 1979). The researcher in the current study did not manage to find any related previous research that studied interlocutor effects on children with ADHD in terms of verbal pragmatic skills. However a research study by Cunningham and Barkley (1979) studied the interactions of TD and children with ADHD with their mothers in free play and structured tasks (20 TD boys and 20 hyperactive boys ranging in age from 6-12 years). They observed that the children with ADHD were more active, less compliant, and less likely to remain on task than their TD peers. Regarding mothers of children with ADHD, they were less likely to respond positively to the child's social interactions, solitary play activities, or compliant on-task behaviours. Also, children with ADHD's mothers imposed more structure and control on the child's play, social interaction, and task-oriented activities which may contribute to the child's behavioural difficulties as

suggested by the research authors. In tune with Cunningham and Barkley's (1979) research findings another research study by Mash and Johnston (1982) conducted a comparison of the mother-child interactions of young and older hyperactive and normal children (43 hyperactive and 53 normal children). Interactions were observed in structured tasks and unstructured play. The mother-child interactions of both younger (age range 2.11 to 6.11) and older (age range 7.3 to 9.10) hyperactive children were compared and contrasted with age-matched normal children. The results showed that the hyperactive children asked more questions and were more negative and noncompliant during play, especially the younger hyperactive group. Regarding the mothers of the hyperactive children it was observed that they were more directive and negative during play and less responsive to child-initiated interactions. Finally, the hyperactive children did not differ from normal children in their reactions to the mother-initiated behaviour during play but engaged in less independent activity when their mothers were noninteractive.

Cohen (1998) hypothesized that most families of children with ADHD experience an alteration in their communication patterns and dynamics. Also, Johnston and Mash (2001) reported in their review of families of children with ADHD that the literature has shown that children with ADHD have difficulties in interactions with their parents. It has also been hypothesized that problems in parent-child interactions are associated with exacerbations or a continuation of ADHD symptoms (Barkley, 2000). According to Green et al., (2014) the focus of mother-child interaction with the child with ADHD may shift from playing to maternal attempts to manage the child's behaviour, which would

result in the interaction style becoming more directive. Previous studies (e.g., Cunningham & Barkley, 1979; Mash & Johnston, 1982) that investigated parent–child interaction patterns in families of children with ADHD compared to TD children consistently demonstrated (a) children with ADHD are less compliant and more negative in parent–child interactions, and (b) their parents use more commands, more negative statements, and less praise.

The previously discussed research studies have suggested that interlocutor differences have both a quantitative and qualitative impact on typically developing children's verbal interaction. At the same time the previous research was not so clear when it comes to the influence of interlocutor differences on the verbal interaction of children with ADHD. Therefore the author decided to investigate the impact of interlocutor familiarity on both the TD and ADHD groups. This was achieved by testing whether or not there was a statistically significant difference in the total number of verbal turns and the average number of words per minute for the FI-child (Familiar interlocutor-child) interaction compared to the UI-child (Unfamiliar Interlocutor-child) interaction. It was expected that interlocutor familiarity would have greater impact on the ADHD group.

1.7 Saudi Arabian culture

Pragmatics is heavily influenced by culture. Culture refers to a distinctive

system of diverse meanings that are shared by an identifiable group of the population. These cultural meanings are transmitted through generations and are enforced by values and beliefs that are practiced through everyday interactions (Garcia Coll & Magnuson, 2000). The fact that parents modify their speech to children is universal however the ways they encourage culturally acceptable uses of language vary among different cultures (Caulfield, 2001). In light of this we find that in cultures where obedience and respect are valued over self-esteem and independence, parents might be less inclined to follow the child's conversational lead. Alternatively, in cultures where parents view their children as malleable and in need of external assistance to learn, parents may use more directives (Johnston & Wong 2002). Efficient pragmatic skills allow the child to interact successfully with others within their linguistic and cultural milieu (Roseberry-McKibbin & Hegde, 2011). As far as the author is aware no previous studies have investigated the use of turn taking, topic initiation and topic maintenance skills at the level of verbal conversation in the Saudi Arabian culture. However, the author's informal observations (over many years) have revealed that these skills are usually controlled by the adult if the conversation is in the form of an adult-child interaction. This can be explained by the fact that Saudi Arabian traditions consider this as an indicator of the child's politeness and discipline.

1.8 Purpose of the study

Firstly, I need to highlight the rationale behind the focus on the targeted age range (4-5 years) which is based on the importance of the age of four that stands on the threshold of full development of pragmatic skills. According to Adams (2002), by the age of four years the range of speech acts is nearly completed. Also, two thirds of the parents of children with ADHD seen in psychiatric clinics reported the age at onset to be four or younger (Connor et al. 2003). From this point, the thesis is divided into two parts:

Quantitative study:

The purpose is to quantitatively examine the characteristics of the verbal pragmatic language skills (verbal output, turns, topic related skills and interlocutor impact), in 4 to 5 year-old Arabic speaking boys with ADHD compared to typically developing children that were matched in age and gender.

Qualitative study:

The purpose of this study is to compare mother-child interactions with the children with ADHD and TD children with respect to conversational repair by the mother and the complexity of responses from the child, in order to reveal and exemplify characteristics that distinguish ADHD discourse from TD discourse.

Another general purpose of the study was to develop a database that contains an audio-visual language sample data set for Saudi Arabian Arabic speaking children. This can be used for developing a knowledge base for Arabic speaking children (specifically Saudi children). The database will be used to address developmental and clinical questions via secondary analyses. Secondary analyses involve testing hypotheses on data that were collected for other primary purposes. Justice et al., (2010) mentioned that secondary analyses of an existing database can provide a potentially cost-effective and time-efficient alternative to the research community. Also, "it can be difficult to ascertain the sample size needed to test certain hypotheses; thus, generating primary data can lead to underpowered research designs with limited generalizability" (Justice et al., 2010, p.40). It is intended that the audio-visual data set will be available via Queen Margaret University (QMU) after getting necessary approval from the primary researcher.

1.9 The study aims

The present study is a preliminary study, which examines the characteristics of the verbal pragmatic language skills in 4 to 5 year-old Arabic speaking children with Attention Deficit Hyperactivity Disorder (ADHD). The aim of the current study is to provide quantitative and qualitative information about the verbal pragmatic aspects of language for Arabic speaking children with ADHD, specifically at the levels of verbal productivity, turns, topic related skills and interlocutor impact, at the quantitative level and mother-child interactions including conversational contributions and repair by the

mother and complexity of responses from the child at the qualitative level. The analysis of verbal productivity, interlocutor impact, turns, topic related skills, and mother-child interactions will hopefully provide speech-language pathologists with information on the contextual use of language. It will also answer questions regarding the efficacy of children's communication and language use, and therefore assist the development of well-designed diagnostic tools and intervention programs. In addition it will provide the scientific and clinical community with an audio-visual data set for Arabic speaking children with ADHD and typically developing children that are matched in age and gender which can be used for more analysis by other researchers.

1.10 Hypotheses

The following hypotheses were investigated in Arabic-speaking 4-5 year old children with ADHD.

Hypothesis one

The verbal output (as represented by the total number of words produced in a controlled session) of children with ADHD is significantly less than that produced by typically developing children in the same age range.

Hypothesis two

The total number of verbal turns is significantly greater when the child interacts with the FI (mother) as opposed to the UI (examiner) and this difference is significantly greater for the children with ADHD.

Hypothesis three

The verbal output is significantly greater when the child interacts with the FI (mother) as opposed to the UI (examiner) and this difference is significantly greater for the children with ADHD compared to typically developing children in the same age range.

Hypothesis four

The average number of words per turn produced in the session by children with ADHD is significantly less than that produced by typically developing children in the same age range.

Hypothesis five

Children with ADHD exhibit a higher ratio of topic initiation to topic maintenance than typically developing children in the same age range.

CHAPTER TWO

Chapter two will outline the research methods and procedures for the quantitative study (the results are reported in chapter three). The design of the study is cross-sectional using two groups (ADHD and TD) which is suitable as a descriptive approach to investigating the children with ADHD's verbal pragmatic behaviours compared to TD considering familiarity of interlocutors which includes unfamiliar (UI) and familiar (FI). This chapter includes four main sections. The first section 2.1 is about the participants; this will describe the criteria and recruitment for both ADHD and the typically developing children and ethical issues. The second section 2.2 is about data collection; this includes a description of a pilot study of the data collection procedures, use of an assistant, the setting, recording equipment and procedures, materials used in the sessions, and procedures. The third section 2.3 deals with data analysis which includes discussions about the coding system, keys of codes, and inter-observer reliability. Finally, the fourth section is about the statistical analysis.

2.1 Participants

This study focused on twenty Saudi 4.0-5.0 year old males from Jeddah (western province of Saudi Arabia); ten had a diagnosis of ADHD and ten were typically developing children. This particular number of participants was needed to provide statistical strength and this age range is considered critical for normal speech and language development. ADHD and typically developing participants were divided into two age bands for the purpose of matching. Five participants from each group

were included in each age band. The first age band was from four years to less than four years and six months. The second age band was from the age of four years and six months to less than the age of five years. Participants in the ADHD and the typically developing groups were matched in age range (from 4.0 to 5.0), gender (male), language (Arabic), nationality (Saudi), normal hearing, no cognitive or major physical disability that interfered with interaction (e.g., intellectually disabled, cerebral palsy, blindness etc.). In Saudi Arabia, since race and ethnicity are not one of the characteristics that identify the population, it, therefore, was not considered in the study.

2.1.1 Participants with ADHD

The ten participants were all Arabic speaking, Saudi Arabian males between 4.0 to 5.0 years-old, who had been diagnosed with ADHD.

2.1.1.1 Criteria

The main inclusion and exclusion criteria for the participants with ADHD were:

1. Attention Deficit Hyperactivity Disorder (ADHD) diagnosis: the participants had been diagnosed with ADHD by a psychiatrist according to DSM-IV. The participants were asked to provide a medical report stating the diagnosis of ADHD. ADHD subtype was not considered in the current research. Also, the medical reports did not mention the particular subtype or severity at the child's diagnosis, and so for the purpose of this research, the term ADHD was used in the general

sense to include any severity of ADHD and all three subtypes of the disorder, namely inattentive, hyperactive and impulsive.

2. Medication: No child was included who had previously received or was taking any medication for ADHD, specifically methylphenidate. This was because previous studies involving that particular drug have suggested that it affects language performance (see section 1.6.1).

3. No medical issues: According to the medical files of the patients participating in the study, all participants were reported by their paediatricians as having normal development within the typical range. Children's medical files included growth charts plotted by their paediatricians. The researcher was granted access to the medical files of the patients participating in the study after parents' approval to participate and consent from signature. Any child with ADHD reported to have a medical problem was excluded from the study.

4. No intervention: No child was included who had previously received any kind of speech and language intervention to avoid any bias from previous therapy but they may have been referred for speech and language assessment.

5. Normal hearing: All participants were required to pass the hearing screening that was conducted by the JISH audiology division.

See Table 2.1 for a summary of all the ADHD inclusion and exclusion criteria and how the researcher obtained the background information.

Table 2.1 Summary of inclusion and exclusion criteria for participants with ADHD.

Parameter	Criterion	Method
Sex	Male	Interview
Age	4.0-5.0 years	Interview
Language	Arabic and monolingual	Interview
Region	Jeddah, Western province of Saudi Arabia	Interview.
Hearing	Within normal limits	Screening by JISH Audiology Division
ADHD Diagnosis	Confirmed diagnosis by psychiatrist.	Report from the psychiatrist.
Medication	No medication	Report from the psychiatrist
Intervention	No speech and language intervention.	Interview
Medical status	No reported medical issues (i.e., cognitive or physical difficulties)	Medical records

2.1.1.2 Recruitment

Participants with ADHD were recruited first. The directors of the Psychiatric Departments of five main medical centres in Jeddah were contacted. These are King Fahad Hospital (KFH), King Abdul-Aziz University Hospital (KAYH), King Faisal Specialist Hospital and Research Centre (KFSHRC), Erfan and Bagdo General Hospital (EBGH), Saudi German Hospital Group (SGHG) (14 participants). In addition to that the researcher (i.e., the author of this thesis) was the director of the Speech-Language Pathology Department in the Jeddah Institute for Speech and Hearing (JISH) during the study, which helped in choosing some possible participants who matched the research criteria from the JISH clinic and who were usually referred to JISH for assessment and intervention services (3 participants).

The aim and procedure of the study were explained to the directors of all the medical centres involved and they were asked to refer possible candidates for the study, as well as provide access to the files of the patients participating in the study. The psychiatrist in each hospital was then contacted by the researcher with the permission of the directors and was asked for referrals. Whenever a patient matched the criteria the psychiatrists contacted the researcher. The researcher would then come and meet with the mother or with both parents and explain the procedure to them, schedule an appointment and ask for permission to videotape the interaction between the unfamiliar interlocutor (UI) and the participant and between the mother and the participant. Participants completed two recordings sessions within approximately one hour, one with UI and the other with FI. There was a break of 10-15 minutes between the two sessions. The researcher also spent time in the psychiatric clinics of each hospital and approached the children's parents whenever their child with ADHD matched the criteria. Seventeen participants met the criteria in terms of ADHD diagnosis and age (fourteen participants were referred from the psychiatric clinics and three were referred from the JISH clinic). Initially, all of these participants agreed to participate in the study; however, when they were re-contacted to schedule appointments for videotaping only eleven agreed to participate (ten participants from the psychiatric clinics and one from the JISH clinic). Finally, one participant was excluded (the excluded participant was referred by the psychiatric clinics) because the main diagnosis changed from ADHD to Pervasive Developmental Disorders not Otherwise Specified (PDD-NOS) and hyperactivity symptoms as a result of reassessment by another psychiatrist. In the participants with ADHD, the diagnosis was made by three psychiatrists using the same

criteria (DSM-IV-TR). In view of the disagreement, the researcher decided to exclude this participant from the study.

2.1.2 Typically developing participants

The ten participants were all typically developing, Arabic speaking, and Saudi Arabian males between 4.0 to 5.0 years-old.

2.1.2.1 Criteria

The main inclusion and exclusion criteria for the typically developing participants were:

1. Normal speech and language skills: the participant's speech skills, including articulation, fluency, voice, and prosody and language skills, including receptive, expressive, pragmatic, were screened at the JISH speech and language division by the researcher and were required to be within normal limits to participate in the study. Since most of the tests used by speech-language pathologists in the Arab world generally and Saudi Arabia specifically are adaptations of language scales that are not standardized for Arabic-speaking children they are used informally. Although, there are standardized formal Arabic tests for the assessment of speech and language development, these tests are mostly standardized for Arabic children from other Arabic countries (e.g., Egypt and Jordan) using different dialects. Therefore, there are many words in these tests that are not used by Saudi children. The Arabic Language Screening Test- Preschool (1999) developed by El-Halees and Elisabeth Wiig was revised by the Jeddah Institute for Speech and Hearing to be used with Saudi children during the current study.

2. Normal behavioural pattern and cognitive skills: the participant's behaviours were evaluated by a psychiatrist and were required to be within normal limits to participate in the study.

3. Normal hearing: All participants were required to pass the hearing screening that was conducted by JISH audiology division to participate in the study.

4. No medical issues: Based on history taken by the researcher and reports by paediatricians during routine medical check-ups.

See Table 2.2 for a summary of the typically developing inclusion and exclusion criteria and how the researcher obtained the background information

Table 2.2 Summary of inclusion and exclusion criteria for typically developing participants.

Parameter	**Criterion**	**Method**
Sex	Male	Interview.
Age	4.0-5.0 years	Interview.
Language	Arabic and monolingual	Interview.
Region	Jeddah, Western province of Saudi Arabia	Interview.
Hearing	Within normal limits	Screening by JISH Audiology Division.
ADHD	No observable behavioural or emotional problems	Interview.
Speech and Language skills	Within normal limits speech and language skills.	JISH screening protocol by ASHA certified SLP.
Medical Status	No reported medical issues (i.e., cognitive or physical difficulties)	Medical records.

2.1.2.2 Recruitment

Typically developing children were recruited from an advertisement in brochures distributed in two preschools. These were the Sherouq Al-Shams preschool and the Al-Mawahip Al-Sagheira preschool (16 subjects). Others were recruited through Saudi staff in JISH via inviting their relatives who matched the criteria of inclusion (four subjects). The researcher contacted all potential participants and asked them to visit the clinic (JISH) to participate in the study. Speech and language screening in addition to hearing screening were offered in return for their participation. Passing both screenings without any conditions was required in order to participate in the study. Twenty individuals volunteered to participate in the study, however only ten were chosen so that the TD and participants with ADHD would be similar in age (4.0 to 5.0). Each participant's hearing was screened on the day of the video-recording. Some were excluded after hearing screening, due to conductive hearing loss (in these cases appropriate referrals were given).

2.1.3 Ethical issues

The current research was granted ethical approval from Queen Margaret University (QMU) research centre and research ethics panel before the actual research started. The potential risks for this study included the risk of confidentiality being broken where there was a likelihood that the participants may be identified by other community members during visits to JISH as they were seen entering the JISH building and the uncompensated time spent by the participants in the JISH Institute while in the study. However, these risks were reasonable as there were anticipated benefits to the

participants through the knowledge that they would undoubtedly gain. For the TD participants it was primarily the hearing test. And for the participants with ADHD benefits also included comprehensive speech and language assessments with comprehensive reports. An informed consent form that explained both the nature of the study and the participant's agreement to participate in the study was given to each parent. Authorization from each participant's parents to use the records from other facilities was obtained. The researcher met with the participants and their parents individually, explained the study to them and obtained their approval to participate in the study (by their reading and signing the consent form). In addition, for the participants recruited from JISH, the parents gave their written consent for the researcher to obtain the diagnosis of the children from their records at JISH.

It was also important to be able to ensure the participants' anonymity. Therefore during the initial interview, data collection, and videotaping, the researcher told participants to specify their initials only on any inventories. The researcher used similar initials on all of the data collection checklists and tally sheets as well as videotapes.

2.2 Data collection

This section provides a description of the pilot study of the data collection procedures, use of assistant, the setting, recording equipment and procedure, materials used in the sessions, procedures and technical issues.

2.2.1 Verification of the validity of the data collection procedures.

No complete separate pilot study was carried out. However the data collection procedures were piloted in order to ascertain whether they were effective and to enable the researcher to be confident that the person playing the part of the UI was sufficiently skilled in applying the research protocol. The pilot study of the data collection procedures involved two participants one Participant with ADHD and one TD participant aged 4;4 years (TD) and 4;6 years (ADHD). The pilot study findings showed that the study procedures were effective in collecting the data for that study. The data for the two pilot study participants were included in the main study.

2.2.2 Use of an assistant

An assistant, who is referred to as the unfamiliar interlocutor (UI), was used for the purpose of data collection only. The same UI was used for all participants. To avoid any possible bias the researcher did not interact with study participants during the data collection. The UI was used for the purpose instead. The UI was not a professional speech and language pathologist and she did not have any knowledge about the purpose or hypothesis of the study and was not involved at any level with the analysis. The assistant was not involved in any other aspect of the study after the data collection sessions. Following the 30-minute session with the UI, free 15-minute interaction took place in the same therapy room with the mother, who was the familiar interlocutor (FI). The entire data collection process was completed in the presence of the researcher who supervised and monitored the data collection process and recording process from the control room (See figure 2.3).

2.2.3 Setting

The study was carried out in a sound treated and carpeted therapy room in the Jeddah Institute for Speech and Hearing (JISH), Jeddah, Saudi Arabia. The room was about 485 cm in width and 550 cm in length. The therapy room had two cabinets and one shelving unit which contained toys that reflected the interests of the target age population (See Fig 2.1 & 2.2).

The same arrangement of seating and materials was used for all interactions. A children's table and a set of chairs were provided, with the interlocutor at one side and the participant sitting at the other side facing the camera. The UI or FI was seated in a position where the fixed camera had a side view of them, so that all interactions would all be recorded.

Figure 2.1 JISH therapy room, front view

Figure 2.2 JISH therapy room, side view

2.2.4 Recording equipment and procedures

Two portable cameras were used to record the UI and the participant or the FI and participant. Both audio and video were used for the purposes of accuracy and representativeness. Also, the recorded audio-visual data will be included in the database. One camera was placed in a corner, attached to the ceiling of the room and was focused on the interaction area. It provided a complete view of the interactions between the participant and the UI or the FI. The other camera followed the participant and focused on all UI/participant and FI/participant interactions. A camera operator was trained to focus the camera on the UI/participant or the FI/participant interactions. Two directional microphones were used. One was fixed to the ceiling and the other was on the mobile camera as it captured conversations. Table 2.3 shows all details of all the relevant equipment that was used.

Table 2.3 Recording equipment details.

Equipment Unit	Model
PANASONIC DVD Video Recorder	Model No. DMR-E20
PANASONIC System Controller	Model No. WV-CV161C
PANASONIC Color CCTV Camera	Model No. WV-CS854B
4-Channel Personal Stereo Mixer	Model No. TS-4540
Phantom Powering Unit (Microphone)	Model No. N66E-N62E
CYP Picture In Picture Controller Unit	Model No. C1P-3

Figure 2.3 JISH control room

Figure 2.4 Camera 1

Figure 2.5 Camera 2

2.2.5 Materials used in the sessions

Materials in the room were prepared in such a way as to stimulate the participant's attention and encourage him to start a conversation. All the objects were out of the participant's reach in order to encourage him to start the conversation with the UI or the FI (e.g., transparent container, toy car with remote control). Age appropriate toys were provided such as:

- Garage with different sizes of vehicles and trucks.
- Castle and different famous cartoon characters.
- Fishing game.
- Plastic Bowling set.
- Flash cards that included the main semantic groups (i.e., body parts, animals, food items, and transportation)
- Bubbles.
- Computer and CDs.

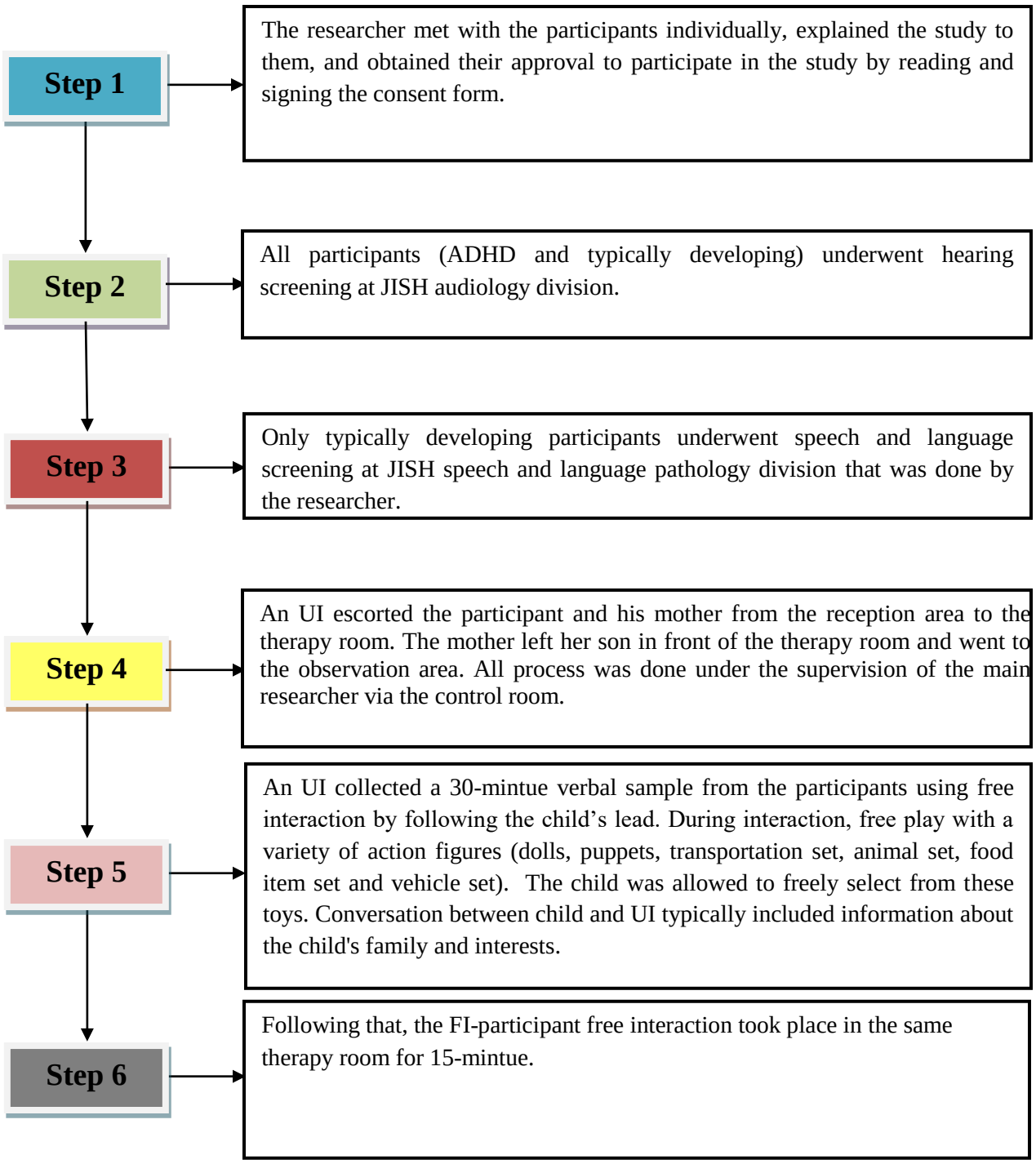
Figure 2.6 JISH materials bank, front view

Figure 2.7 JISH materials bank, side view

2.2.6 Procedures

Once the protocol was approved by the ethics committee the study commenced. The researcher then applied for the equipment needed to observe and record the UI/participant and FI/participant interaction. As soon as parents agreed to participate in the study, the interaction was recorded on the same day as the parent's interview. All participants were sitting facing the camera directly to facilitate easier scoring. All interactions were taped on DVDs using two video cameras. These procedures yielded a 45-minute sample for every ADHD and TD participants, a 30-minute sample with UI and a 15-minute sample with FI for every ADHD and TD participant was used in the study. For all participants the videotaping procedures were exactly the same. The data collection procedure included six steps (see figure 2.8).

Figure 2.8 Study procedures



2.3 Analysis

All coding and analysis processes for all participants' samples were done by the researcher only. Subsequently a reliability test was carried out (see section 2.3.3 below). The researcher followed the techniques of the categorical observational tool (Hegde, 2003). This is a closed system that defines in advance the target categories into which all participants' verbal behaviours are coded by the researcher during the observation for the recorded audio-visual data to analyse the sample. The coded categories are then added together, so that observations can be described quantitatively. The measurements included the number of turns, number of words per turn, number of instances of topic initiation, and number of instances of topic maintenance. A turn was counted as any topically coherent spoken vocal expression that included one word or more from the participant that was directed towards the interlocutor. If the participant spoke about a topic and subsequently introduced a new topic or comment without input from the interlocutor, two turns were coded for the participant. For the number of words, the researcher counted the number of words in each turn. For topic initiation, the researcher counted the following behaviours as topic initiation: greetings on arrival and departure e.g., saying alsalumalukuim (Islamic greeting), invitation to interact or share activities, asking a direct question, spontaneous naming, commenting, and saying something descriptive (e.g., "big", "cool"). For topic maintenance, the researcher counted the following behaviours as topic maintenance: relevant comments on the topic and asking questions to maintain the topic. Thus if the child asked two separate questions about the same item, the second question would be counted as an instance of topic maintenance.

2.3.1 Coding system

The analysis of the audio-visual taped data relied on a coding system that was considered to represent the target communicative behaviours and their frequency of occurrence (See Appendix B that includes coding protocol) during the recorded audio visual data. The coding system that was developed considered the key aspects of the targeted verbal behaviours, i.e. number of utterances, number of words per utterance, topic initiation, and topic maintenance.

Table 2.4 Frequency of occurrence form

Turn number	Time from Start of interaction	Number of words in turn	Topic initiation	Topic maintenance

2.3.2 Keys of codes

The data analysis for this study relied on the use of videotaping for the different aspects of interaction between the UI and the participant and the FI and the participant. The video sample was analysed using the profiling coding system shown in the table 2.4.

2.3.3 Inter-observer reliability

To determine inter-observer reliability, two external senior speech-language pathologists independently recoded 10 minutes of six randomly selected video sessions (three ADHD and three TD) using the same coding protocol. Recoded data sheets were compared one by one for all targeted verbal behaviours with the researcher's coding

sheets. Inter-observer agreement was calculated by dividing the number of agreements between the researcher's codes and the two senior speech-language pathologists' codes by the number of agreements plus disagreements and then multiplying by 100. Both results were compared. For all targeted verbal behaviours an agreement of 94.7% was found. The kappa coefficient was calculated on the relationship between the researcher's codes and the two senior speech-language pathologist's codes. The results revealed a high level of agreement; it was found that the Kappa Coefficient was 0.93 which is almost perfect agreement in all coding areas.

2.4 Statistical analysis

One-tailed between-group and within-group tests were used. In the one-tailed between-group design, the two groups (ADHD and TD) were compared in terms of the total number of words produced in the session, the total number of verbal turns produced in the session, the ratio of topic initiation to topic maintenance, the average number of words per minute when the child interacts with the FI as opposed to the UI, and the average number of words per turn when the child interacts with the FI as opposed to the UI.

In the within-group design, the child interactions were compared with the FI as opposed to the UI in both groups (ADHD and TD) in terms of the total number of verbal turns, the verbal output, and the average number of words per turn. It was required for the within-group design to make an adjustment for the length difference between the UI and FI sessions (the UI session was twice as long as the FI). For the measure of total

number of verbal turns the adjustment comprised dividing the total number of verbal turns by each ADHD and TD participant during interaction with UI by two. Then, for the verbal output during interaction with UI the results were divided by 30 and the FI results were divided by 15. This enabled the measure to be expressed as the average number of words per minute. However, it should be emphasized that 'per minute' here means per minute of the session not per minute of the child speaking.

CHAPTER THREE

This chapter describes the results and analysis of the quantitative study with respect to the hypotheses. Section 3.1 provides an overview of the statistical analysis procedures used. Sections 3.2 to 3.16 present details of data gathered from the children with ADHD and TD children during interactions with UI and FI. The section 3.17 contains the correlation analysis. Finally, section 3.18 contains the summary of findings.

3.1 Data analysis

After data entry into a specially designed spreadsheet using Microsoft Excel, a print out of the data was used in order to carry out a thorough revision and correction of any entry mistakes. Then the file was transferred to SPSS version 17 and the following were performed:

1. Exploration of the data:

    a) This yielded complete descriptive statistics including the minimum and maximum, range, mean, median and inter-quartile range for each variable.

    b) A normality test was performed and most of the variables resulted in a significant Kolmogorov-Smirnov (K-S) (see Table 3.1).

Table 3.1 Tests of Normality

Variables	Clinical Status	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Age (month)	TD	.176	10	.200*	.957	10	.749
	ADHD	.168	10	.200*	.924	10	.392
The total number of verbal turns UI	TD	.338	10	.002	.815	10	.022
	ADHD	.212	10	.200*	.789	10	.011
The total number of verbal turns FI	TD	.276	10	.030	.763	10	.005
	ADHD	.184	10	.200*	.857	10	.071
The total number of words in session UI	TD	.128	10	.200*	.985	10	.988
	ADHD	.373	10	.000	.589	10	.000
The total number of words in session FI	TD	.194	10	.200*	.956	10	.737
	ADHD	.196	10	.200*	.885	10	.150
The average number of words per turn UI	TD	.206	10	.200*	.872	10	.104
	ADHD	.257	10	.061	.794	10	.012
The average number of words per turn FI	TD	.266	10	.044	.846	10	.052
	ADHD	.200	10	.200*	.939	10	.543
The average number of words per minute UI	TD	.135	10	.200*	.984	10	.981
	ADHD	.373	10	.000	.590	10	.000
The average number of words per minute FI	TD	.194	10	.200*	.956	10	.737
	ADHD	.193	10	.200*	.887	10	.157
The number of TI UI	TD	.132	10	.200*	.917	10	.333
	ADHD	.264	10	.047	.806	10	.017
The number of TI FI	TD	.156	10	.200*	.983	10	.980
	ADHD	.258	10	.058	.843	10	.048
The number of TM turns UI	TD	.192	10	.200*	.889	10	.165
	ADHD	.251	10	.073	.717	10	.001
The number of TM turns FI	TD	.226	10	.158	.889	10	.167
	ADHD	.156	10	.200*	.944	10	.601
TI and TM ratio UI	TD	.154	10	.200*	.960	10	.788
	ADHD	.142	10	.200*	.963	10	.824
TI and TM ratio FI	TD	.233	10	.132	.862	10	.080
	ADHD	.289	10	.018	.782	10	.009

a. Lilliefors Significance Correction
*. This is a lower bound of the true significance.

If the p value is <0.05 this means that the variable is not-normally distributed. After all using non-parametric statistics is more conservative than using the parametric statistics.

2. Data was described using minimum, maximum, median and inter-quartile range (IQR).

3. Comparisons were carried out in two steps:

   a) Between group comparison: One-tailed analysis for comparison between typically developing children (TD) (considered as the control group) and children with ADHD (considered as the study group) using a Mann-Whitney U test for two independent variables.

   b) Within group comparison: One-tailed analysis for comparison between the relevant variable in the data from FI session and in the UI session using a Wilcoxon Signed Ranks Test.

4. Non-Parametric correlation using Kendall's tau-b correlation was used in each group separately as pooling of data together seemed inappropriate. Correction of *p* value for multiple testing: the significance threshold was set to 0.01

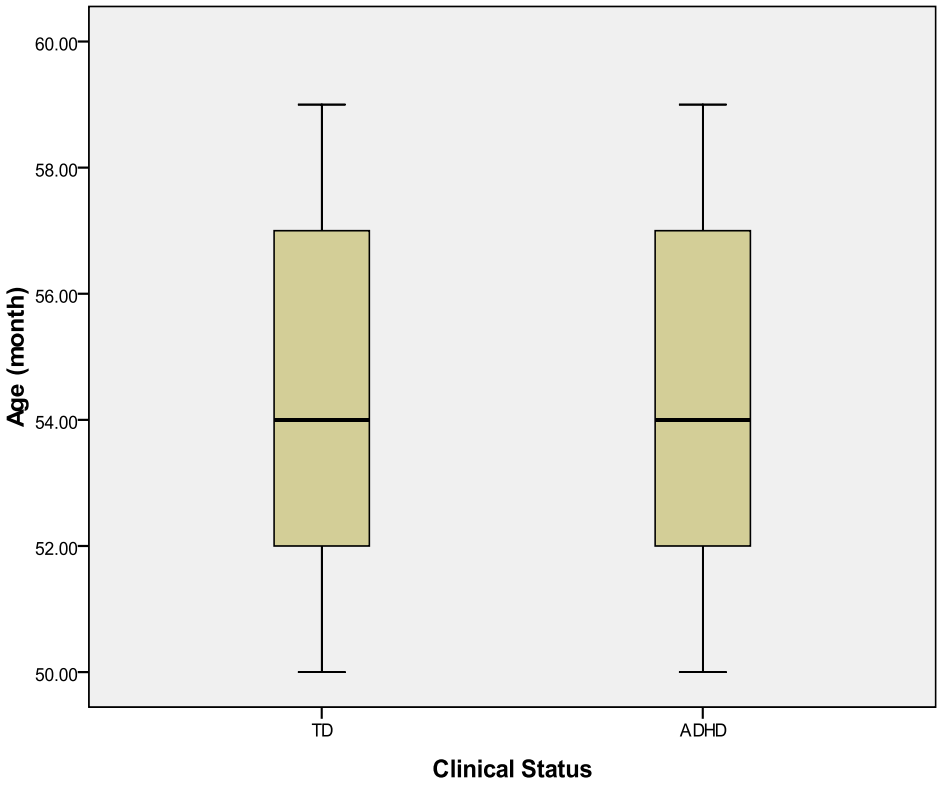
In the present study the following were assumed: the Alpha level of significance is set at $p \leq .05$; values slightly above the .05 level are reported as trends toward significance, to lessen the possibility of Type 2 errors.

3.2 Age

The age of the child could be considered as a confounder so comparison between age (in months) was performed between the two groups and it revealed that age in the TD group ranged from a minimum of 50 to a maximum of 59 months with a median of 54 and an IQR of 5.5 months while in the ADHD group it ranged from a minimum of 50 to a

maximum of 59 months with a median of 54 and an IQR of 5.75 months. The Mann-Whitney U test was 49.5 with a Z value of 0.038 (p= 0.485). This indicates A non-significant difference in age between the two groups. Figure 3.2 contains box plots of age for the TD and the Participant with ADHD groups. In the box plot, the thick horizontal line represents the median, the box represents the inter-quartile range (between the 25th and 75th percentiles) which contains 50% of the data, while the whiskers represent the minimum and maximum values after excluding the outlier values which are represented by dots with a number denoting the case identifier.

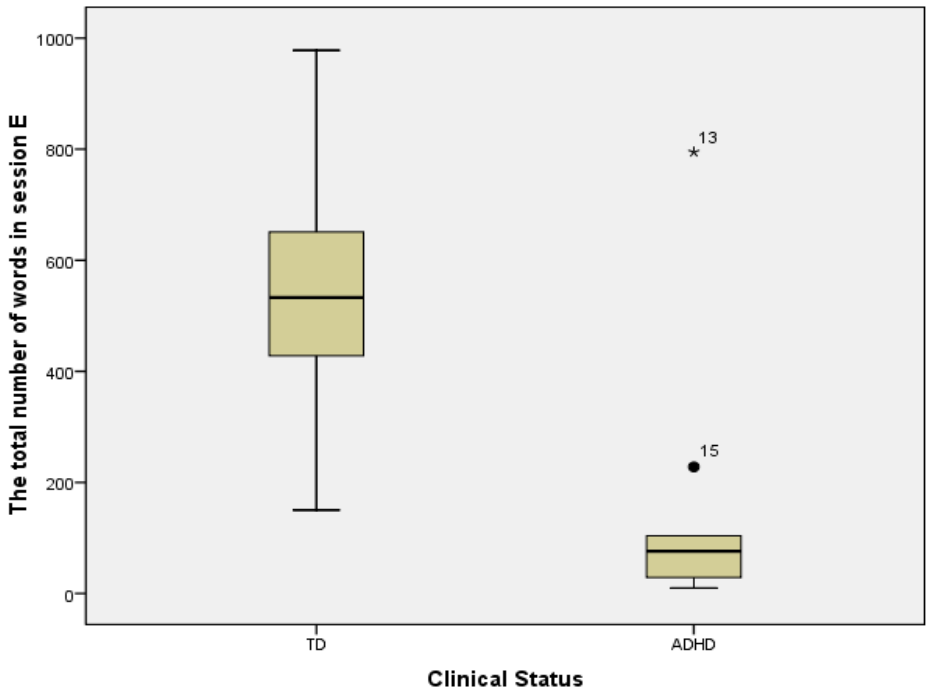
Figure 3.2 Box and whisker plot of the ages of the two participant groups: TD children and children with ADHD.



3.3 The total number of words in the sessions with the unfamiliar interlocutor (UI)

The total number of words with UI in the TD group ranged from a minimum of 150 to a maximum of 978 with a median of 533 and an IQR of 288 while in the ADHD group it ranged from a minimum of 10 to a maximum of 795 with a median of 76 and an IQR of 107. The Mann-Whitney U test revealed that the total number of words in the ADHD group was significantly lower when compared with the TD group (Mann-Whitney U = 10, Z=3.024, p=0.001).

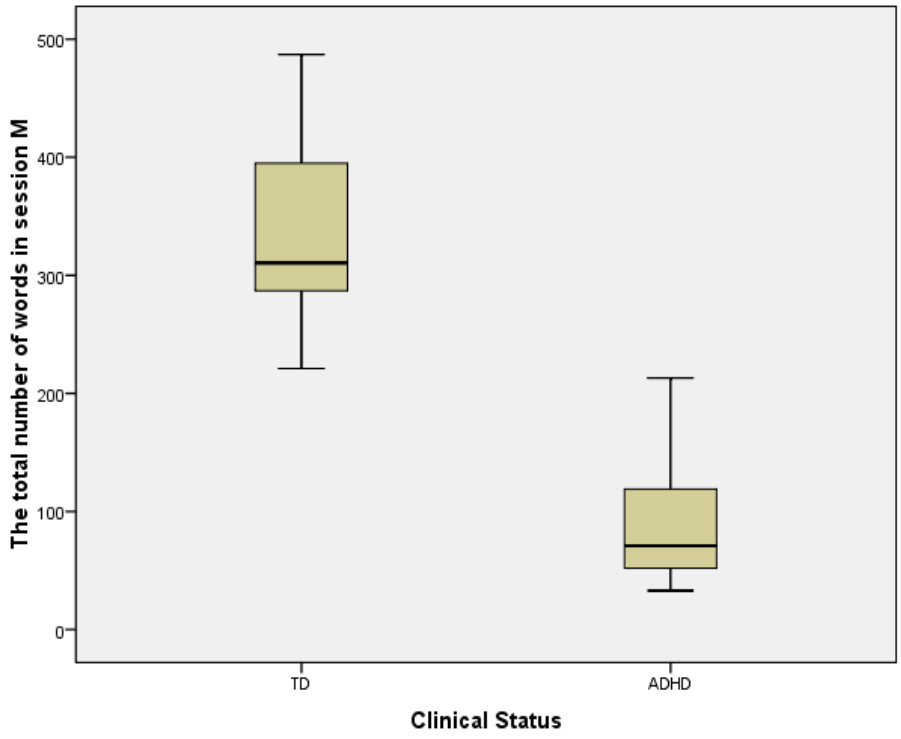
Figure 3.3 Box and whisker plot of the total number of words in the session with the UI of the two participant groups: the TD and the ADHD.



3.4 The total number of words in the sessions with the familiar interlocutor (FI)

The total number of words in the session with FI in the TD group ranged from a minimum of 221 to a maximum of 487 with a median of 310.5 and an IQR of 122 while in the ADHD group it ranged from a minimum of 33 to a maximum of 213 with a median of 71 and an IQR of 75. The Mann-Whitney U test revealed that the total number of words in the ADHD group was significantly lower when compared with the TD group (Mann-Whitney U = 0, Z=3.780, p=0.000).

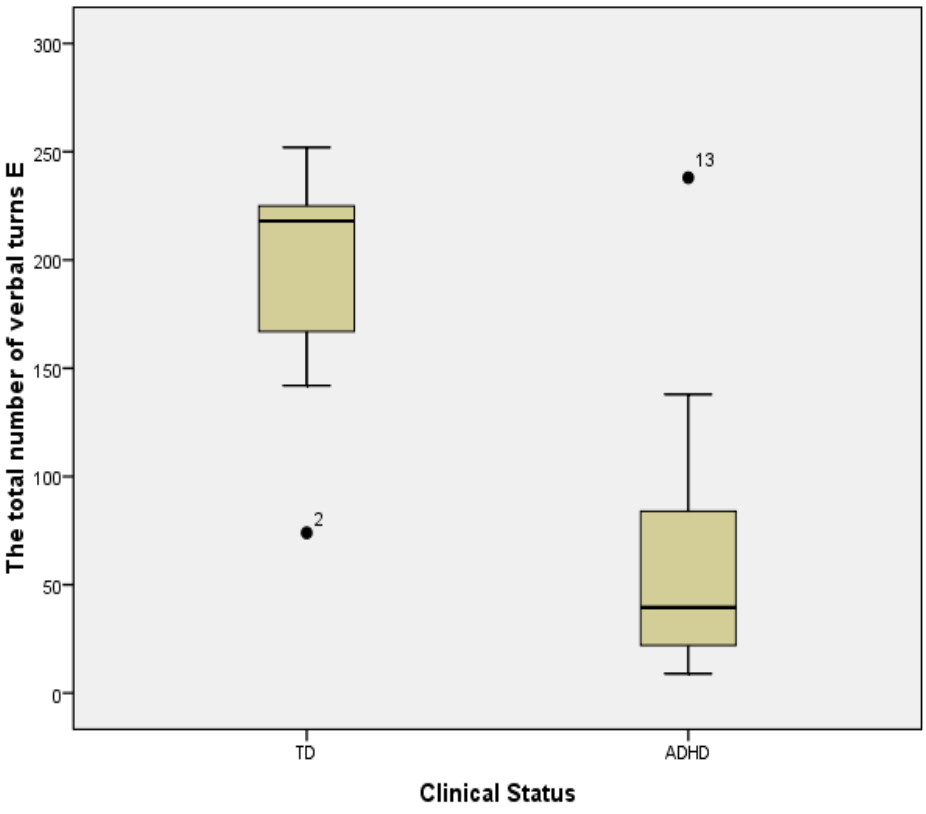
Figure 3.4 Box and whisker plot of the total number of words in the session with the FI of the two participant groups: the TD and the ADHD.



3.5 The total number of verbal turns in the sessions with the unfamiliar interlocutor (UI)

The total number of verbal turns with UI in the TD group ranged from a minimum of 74 to a maximum of 252 with a median of 218 and an IQR of 67 while in the ADHD group it ranged from a minimum of 9 to a maximum of 238 with a median of 39.5 and an IQR of 78. The Mann-Whitney U test revealed that the total number of verbal turns with UI in the ADHD group was significantly lower when compared with the TD group (Mann-Whitney U = 11, Z=2.949, p=0.001).

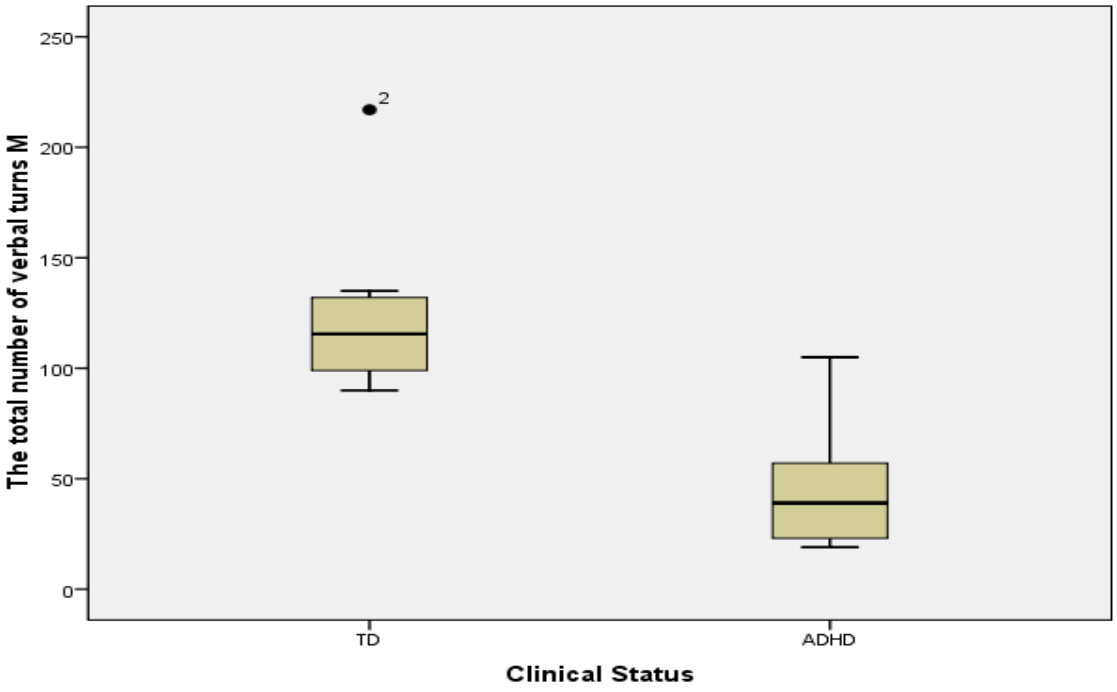
Figure 3.5 Box and whisker plot of the total number of verbal turns with UI of the two participant groups.



3.6 The total number of verbal turns in the sessions with the familiar interlocutor (FI)

The total number of verbal turns with FI in the TD group ranged from a minimum of 90 to a maximum of 217 with a median of 115.5 and an IQR of 34 while in the ADHD group it ranged from a minimum of 19 to a maximum of 105 with a median of 39 and an IQR of 42. The Mann-Whitney U test revealed that the total number of verbal turns in the session with FI in the ADHD group was significantly lower when compared with the TD group (Mann-Whitney U = 3, Z= 3.554, p= 0.000). Using the Wilcoxon signed ranks test for between-group comparison revealed no significant difference in the total number of verbal turns between UI session and FI session in the TD group (Z=1.362, p=0.086) as well as in the ADHD group (Z=1.224, p=0.110).

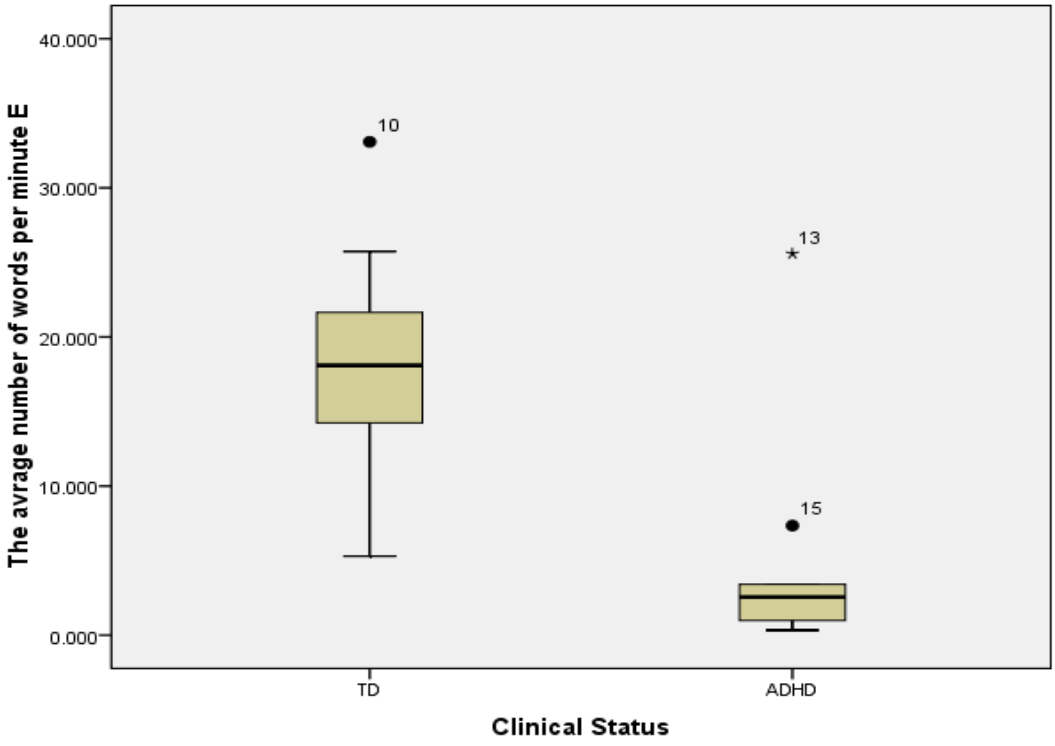
Figure 3.6 Box and whisker plot of the total number of verbal turns in session with FI of the two participant groups: the TD and the ADHD.



3.7 The average number of words per minute in the sessions with the unfamiliar interlocutor (UI)

The average number of words per minute in the sessions with the UI in the TD group ranged from a minimum of 5.295 to a maximum of 33.085 with a median of 18.088 and an IQR of 9.454 while in the ADHD group it ranged from a minimum of 0.333 to a maximum of 25.579 with a median of 2.553 and an IQR of 3.424. The Mann-Whitney U test revealed that the average number of words per minute in the session with UI in the ADHD group was significantly lower when compared with the TD group (Mann-Whitney U=9, Z=3.099, p=0.001).

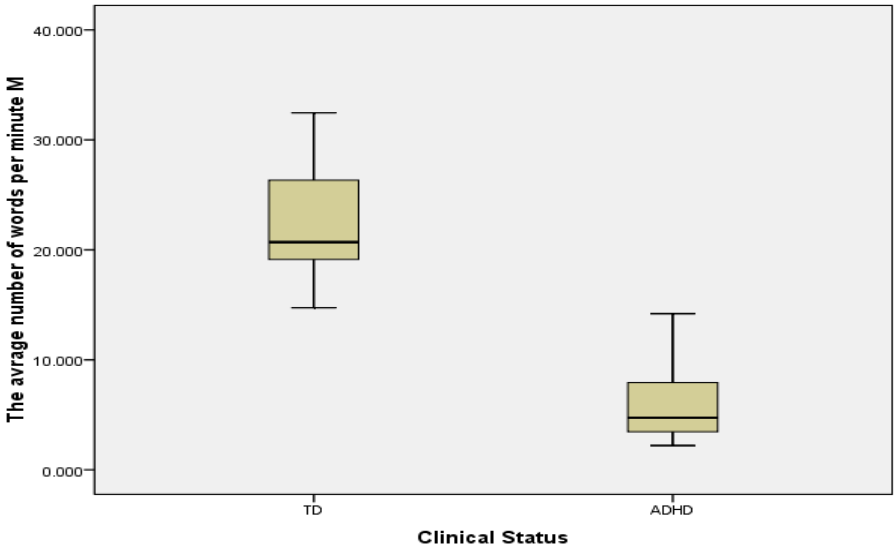
Figure 3.7 Box and whisker plot of the average number of words per minute in the session with the UI of the two participant groups: the TD and the ADHD.



3.8 The average number of words per minute in the sessions with the familiar interlocutor (FI)

The average number of words per minute in the sessions with the FI in the TD group ranged from a minimum of 14.733 to a maximum of 32.467 with a median of 20.700 and an IQR of 8.150 while in the ADHD group it ranged from a minimum of 2.200 to a maximum of 14.200 with a median of 4.733 and an IQR of 5.023. The Mann-Whitney U test revealed that the average number of words per minute in the session with FI in the ADHD group was significantly lower when compared with the TD group (Mann-Whitney U=0, Z=3.780, p=0.000). Using the Wilcoxon signed ranks test for between-group comparison, no significant difference was revealed in the average number of words per minute between UI session and FI session in either the TD group (Z=1.070, p=0.143) or the ADHD group (Z=1.478, p=0.070).

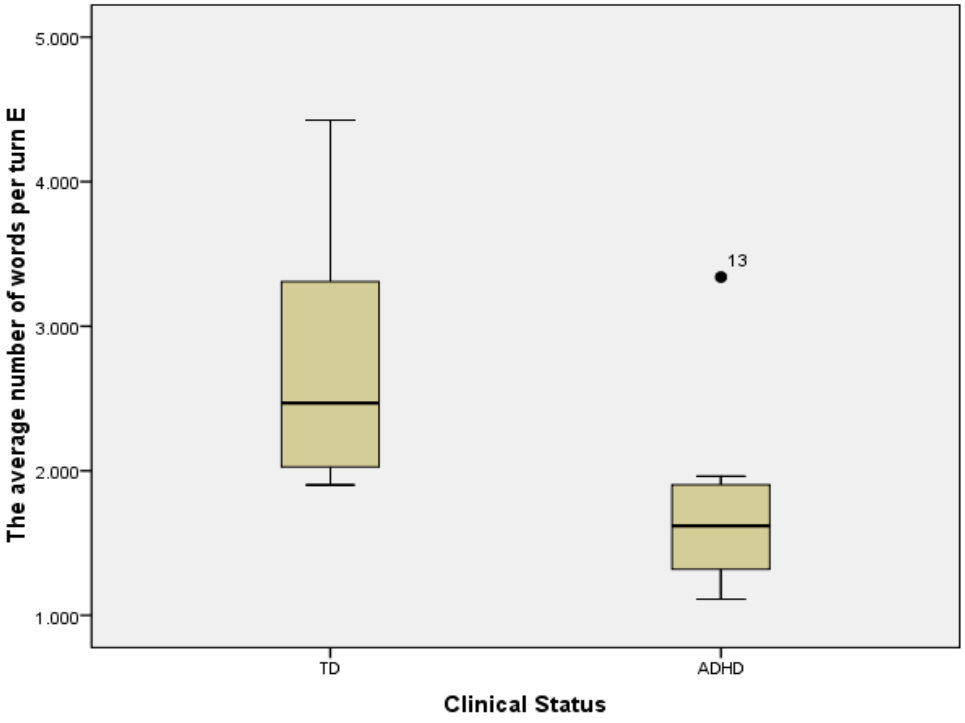
Figure 3.8 Box and whisker plot of the average number of words per minute in the sessions with the FI of the two participant groups: the TD and the ADHD.



3.9 The average number of words per turn in the sessions with the unfamiliar interlocutor (UI)

The average number of words per turn in the sessions with UI in the TD group ranged from a minimum of 1.902 to a maximum of 4.425 with a median of 2.467 and an IQR of 1.444 while in the ADHD group it ranged from a minimum of 1.111 to a maximum of 3.340 with a median of 1.618 and an IQR of 0.620. The Mann-Whitney U test revealed that the average number of words per turn in the ADHD group was significantly lower when compared with the TD group (Mann-Whitney U=10, Z=3.024, p=0.001).

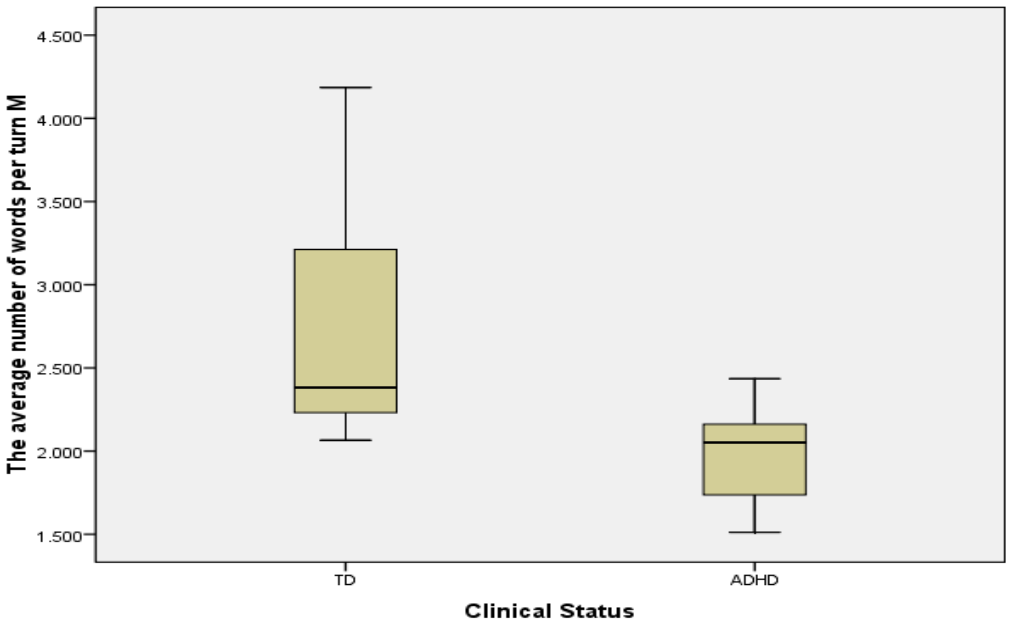
Figure 3.9 Box and whisker plot of the average number of words per turn in the sessio with the UI of the two participant groups: the TD and the ADHD.



3.10 The average number of words per turn in the sessions with the familiar interlocutor (FI)

The average number of words per turn in the sessions with the FI in the TD group ranged from a minimum of 2.065 to a maximum of 4.186 with a median of 2.382 and an IQR of 1.097 while in the ADHD group it ranged from a minimum of 1.512 to a maximum of 2.435 with a median of 2.051 and an IQR of 0.473. The Mann-Whitney U test revealed that the average number of words per turn in the ADHD group was significantly lower when compared with the TD group (Mann-Whitney U=9, Z=3.099, p=0.001). Using the Wilcoxon signed ranks test for between-group comparison revealed no significant difference in the average number of words per turn between UI session and FI session in the TD group (Z=0.764, p=0.223) as well as in the ADHD group (Z=1.478, p=0.070).

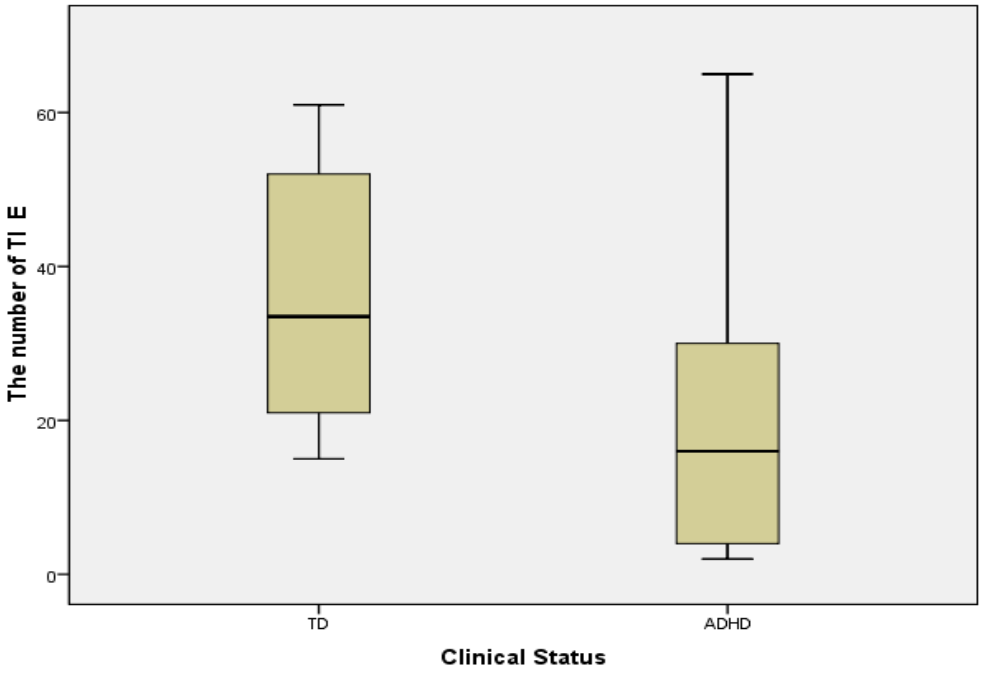
Figure 3.10 Box and whisker plot of the average number of words per turn in the session with the FI of the two participant groups: the TD and the ADHD.



3.11 The number of instances of topic initiations in the sessions with the unfamiliar interlocutor (UI)

The number of instances of topic initiations in the sessions with the UI in the TD group ranged from a minimum of 15 to a maximum of 61 with a median of 33.50 and an IQR of 34 while in the ADHD group it ranged from a minimum of 2 to a maximum of 65 with a median of 16 and an IQR of 34. The Mann-Whitney U test revealed that there was no significant difference in the number of topic initiations in the session with UI in the ADHD group when compared with the TD group (Mann-Whitney U = 31, Z=1.440, p=0.075).

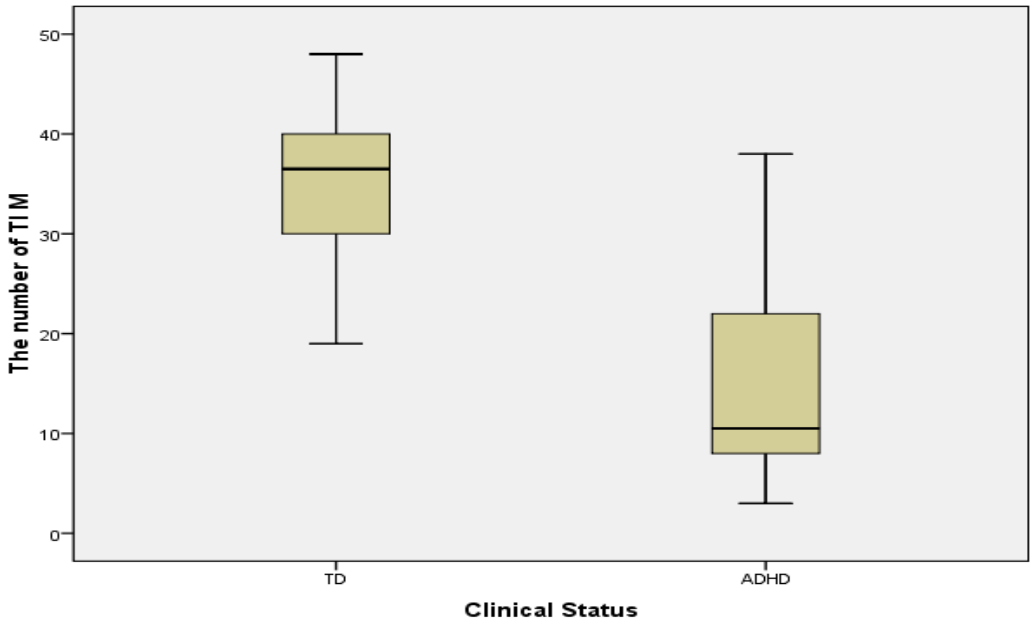
Figure 3.11 Box and whisker plot of the number of topic initiations in the session with the UI of the two participant groups: the TD and the ADHD.



3.12 The number of instances of topic initiations in the sessions with the familiar interlocutor (FI)

The number of instances of topic initiations in the sessions with the FI in the TD group ranged from a minimum of 19 to a maximum of 48 with a median of 36.50 and an IQR of 12 while in the ADHD group it ranged from a minimum of 3 to a maximum of 38 with a median of 10.50 and an IQR of 19. The Mann-Whitney U test revealed that the number of topic initiations in the sessions with FI in the ADHD group was significantly lower when compared with the TD group (Mann-Whitney U=13, Z=2.800, p=0.003).

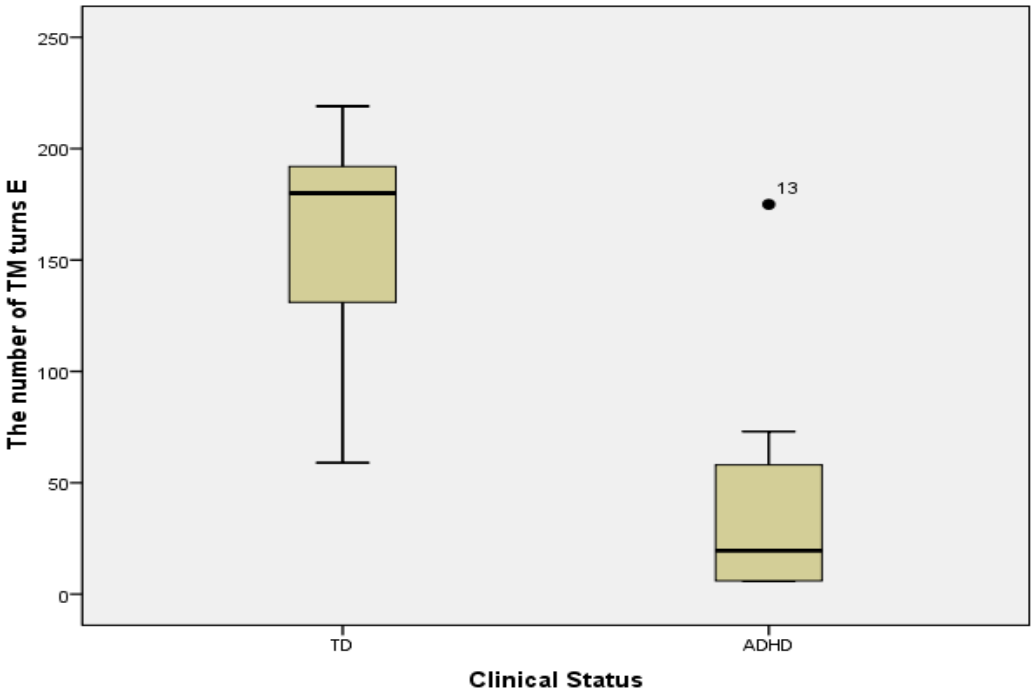
Figure 3.12 Box and whisker plot of the number of instances of topic initiation in the session with the FI of the two participant groups: TD children and children with ADHD.



3.13 The number of instances of topic maintenance in the sessions with the unfamiliar interlocutor (UI)

The number of instances of topic maintenance in the sessions with the UI in the TD group ranged from a minimum of 59 to a maximum of 219 with a median of 180 and an IQR of 66 while in the ADHD group it ranged from a minimum of 6 to a maximum of 175 with a median of 19.50 and an IQR of 56. The Mann-Whitney U test revealed that the number of instances of topic maintenance in the session with UI in the ADHD group was significantly lower when compared with the TD group (Mann-Whitney U=6, Z=3.332, p=0.000).

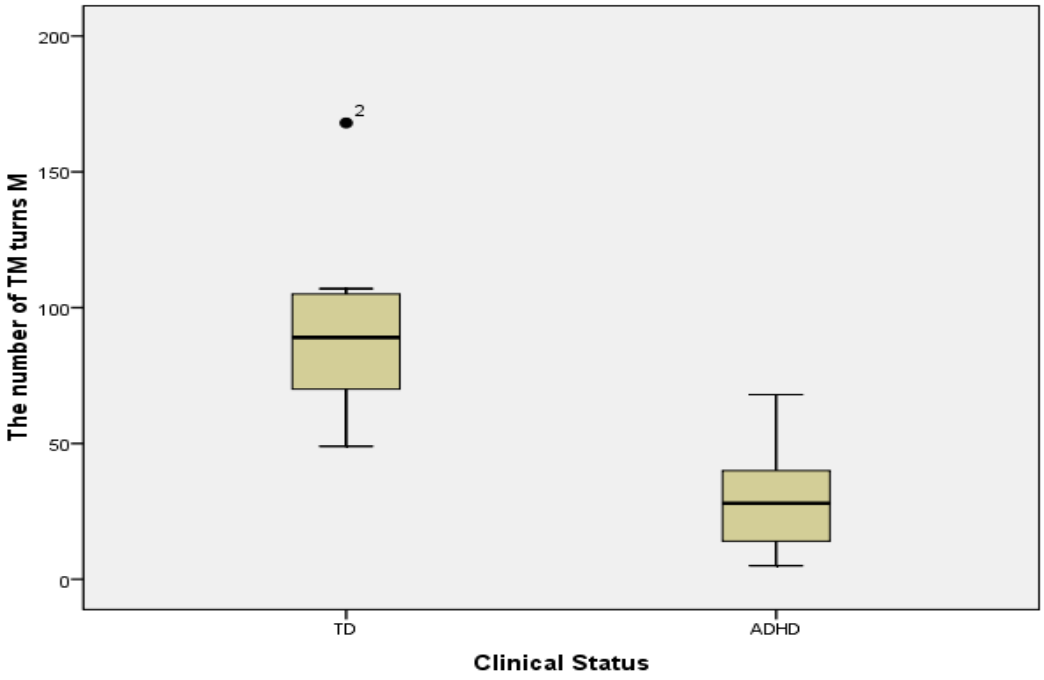
Figure 3.13 Box and whisker plot of the number of instances of topic maintenance in the session with the UI of the two groups: TD and ADHD.



3.14 The number of instances of topic maintenance in the sessions with the familiar interlocutor (FI)

The number of instances of topic maintenance in the sessions with the FI in the TD group ranged from a minimum of 49 to a maximum of 168 with a median of 89 and an IQR of 36 while in the ADHD group it ranged from a minimum of 5 to a maximum of 68 with a median of 28 and an IQR of 31. The Mann-Whitney U test revealed that the number of instances of topic maintenance in the session with FI in the ADHD group was significantly lower when compared with the TD group (Mann-Whitney U=2, Z=3.631, p=0.000).

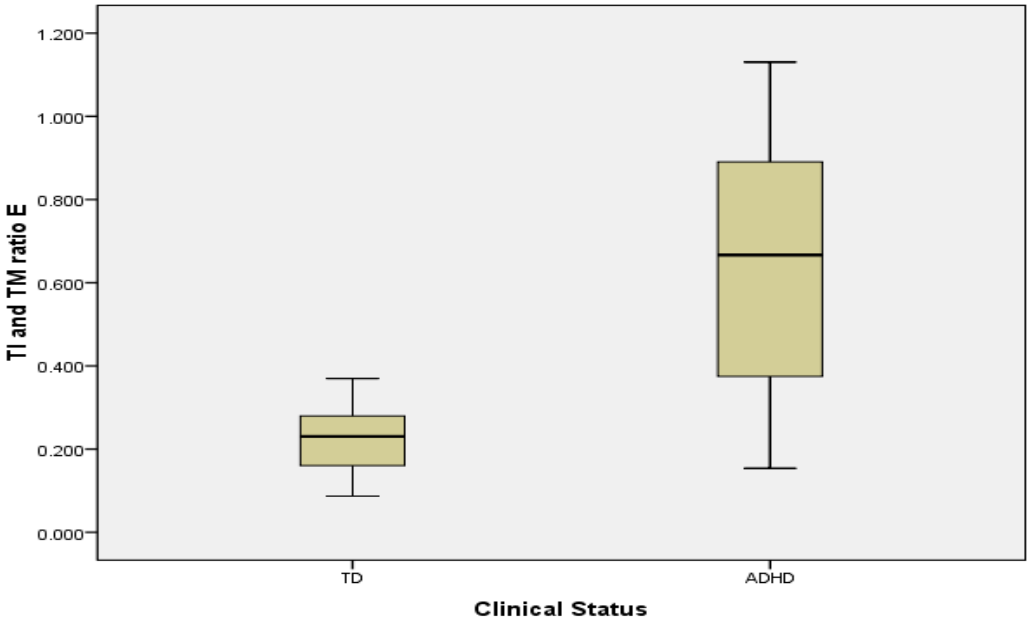
Figure 3.14 Box and whisker plot of the number of instances of topic maintenance in the session with the FI of the two participant groups: the TD and the ADHD.



3.15 Topic initiation to topic maintenance ratio in the sessions with the unfamiliar interlocutor (UI)

The researcher decided to study the topic initiation to topic maintenance ratio rather than studying them as separate phenomena to avoid any possible impact from the reduced verbal output in the children with ADHD. The Topic initiation to topic maintenance ratio in the sessions with the UI in the TD group ranged from a minimum of 0.087 to a maximum of 0.370 with a median of 0.230 and an IQR of 0.143 while in the ADHD group it ranged from a minimum of 0.154 to a maximum of 1.130 with a median of 0.666 and an IQR of 0.548. The Mann-Whitney U test revealed that the topic initiation to topic maintenance ratio in the session with UI in the ADHD group was significantly higher when compared with the TD group (Mann-Whitney U=9, Z=3.100, p=0.001).

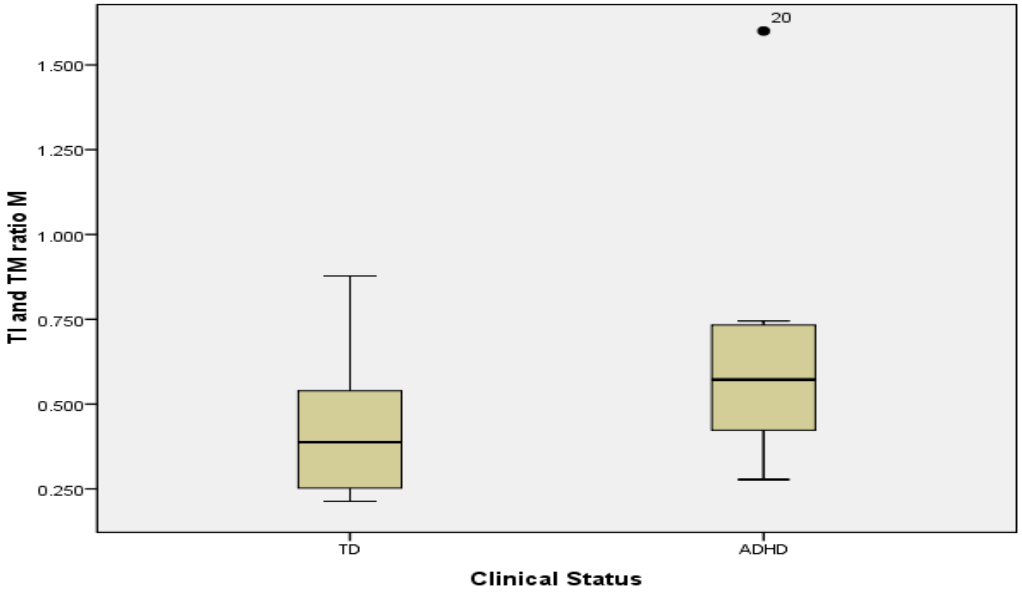
Figure 3.15 Box and whisker plot of the topic initiation to topic maintenance ratio in the session with the UI of the two participant groups: the TD and the ADHD.



3.16 Topic initiation to topic maintenance ratio in the sessions with the familiar interlocutor (FI)

Topic initiation to topic maintenance ratio in the session with the FI in the TD group ranged from a minimum of 0.213 to a maximum of 0.878 with a median of 0.387 and an IQR of 0.293 while in the ADHD group it ranged from a minimum of 0.278 to a maximum of 1.6 with a median of 0.572 and an IQR of 0.338. The Mann-Whitney U test revealed that there was no significant difference in topic initiation to topic maintenance ratio in the session with FI in the ADHD group compared with the TD group (Mann-Whitney U=28, Z=1.663, p=0.048). Using a Wilcoxon signed ranks test for between-group comparison revealed a significant difference in the topic initiation to topic maintenance ratio between the UI session and the FI session in the TD group (Z=2.701, p=0.004), while there was no significant difference in the ADHD group (Z=0.102, p=0.465).

Figure 3.16 Box and whisker plot of the Topic initiation to topic maintenance ratio in the session with the FI of the two participant groups: TD and ADHD.



3.17 Correlation analysis

The correlation analysis was conducted to assess whether the total number of verbal turns correlated with the total number of words, the average number of words per minute, the number of instances of topic initiations, and the number of instances of topic maintenance during UI session and FI session. Using Kendall's tau-b correlation coefficient in the TD children there was a significant positive correlation between the total number of verbal turns in the FI session and the number of instances of topic maintenance turns in the FI session (r=0.809, p=0.001) (see Figure 3.17). In the ADHD group only, there was also a significant positive correlation between the total number of verbal turns in the UI session and: 1) the total number of words in the UI session (r=0.989, p=0.000) (see Figure 3.18), 2) the average number of words per minute in the UI session (r=0.989, p=0.000) (see Figure 3.19), 3) the number of instances of topic initiations in the UI session ((r=0.744, p=0.004) (see Figure 3.20), and 4) the number of instances of topic maintenance in the UI session (r=0.814, p=0.001) (see Figure 3.21). Also, in the ADHD group only, there was a significant positive correlation between the total number of verbal turns in the FI session and: 1) the total number of words in the FI session (r=0.899, p=0.000) (see Figure 3.22), 2) the average number of words per minute in the FI session (r=0.899, p=0.000) (see Figure 3.23), 3) the number of instances of topic initiations in the FI session ((r=0.750, p=0.003) (see Figure 3.24), and 4) the number of instances of topic maintenance in the FI session (r=0.886, p=0.000) (see Figure 3.25).

Figure 3.17 Scatter plot showing a best fit regression line with significant positive correlation between the total number of verbal turns in the FI sessions and the number of topic maintenance turns in the FI sessions in TD children (r=0.809, p=0.000).

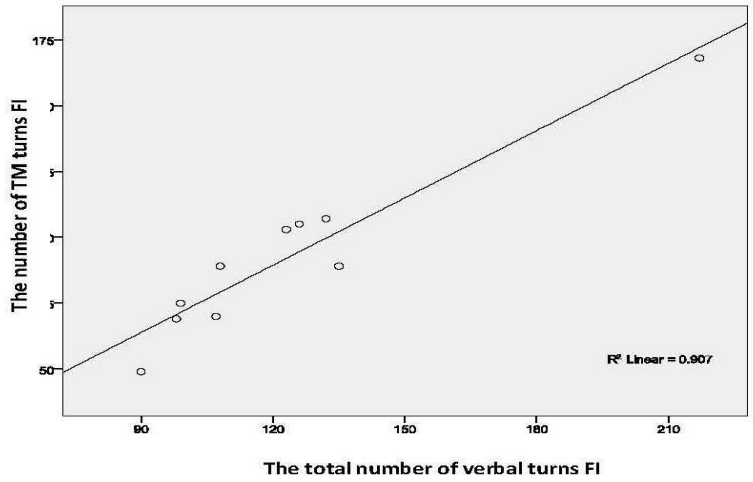


Figure 3.18 Scatter plot showing a best fit regression line with a significant positive correlation between the total number of verbal turns in the UI sessions and the total number of words in the UI sessions in children with ADHD (r=0.989, p=0.000).

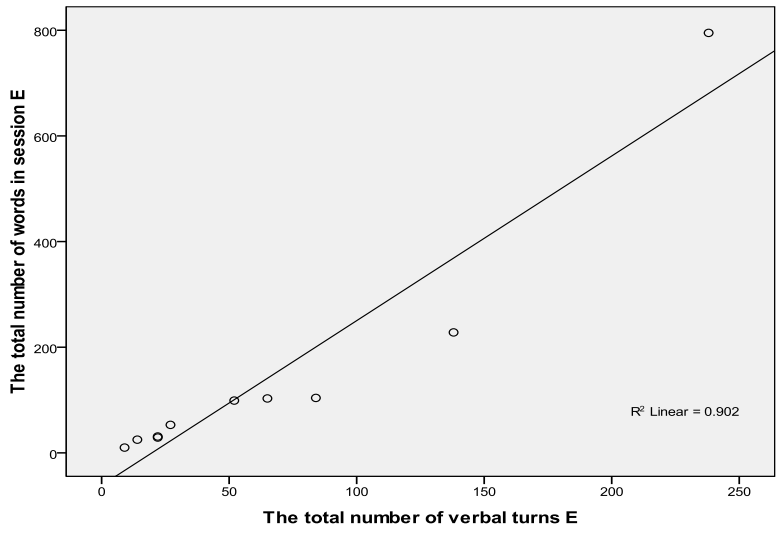


Figure 3.19 Scatter plot showing a best fit regression line with a significant positive correlation between the total number of verbal turns in the UI sessions and the average number of words per minute in the UI sessions in children with ADHD (r=0.989, p=0.000).

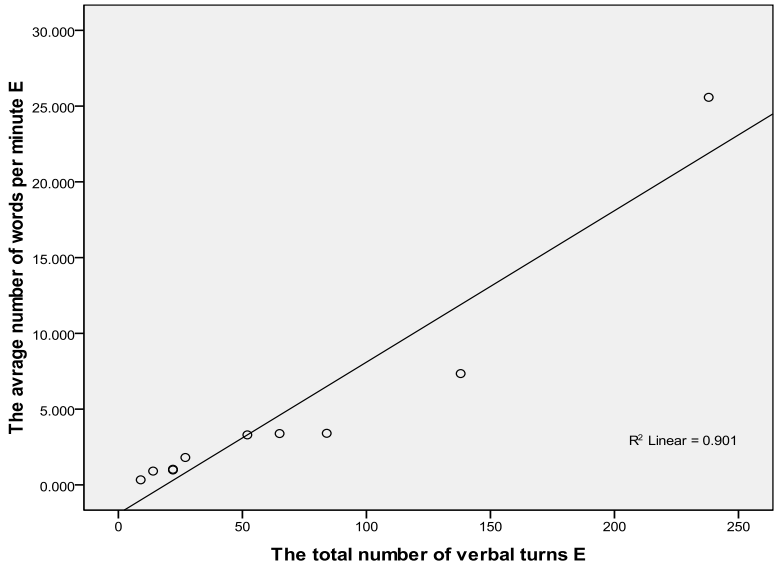


Figure 3.20 Scatter plot showing a best fit regression line with a significant positive correlation between the total number of words in the UI sessions and the number of topic initiations in the UI sessions in children with ADHD (r=0.744, p=0.004).

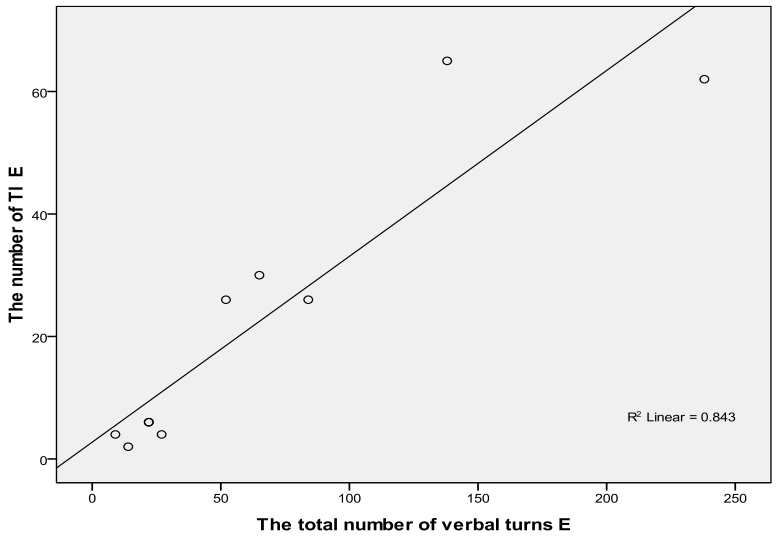


Figure 3.21 Scatter plot showing a best fit regression line with a significant positive correlation between the total number of words in the UI sessions and the number of instances of topic maintenance in the UI sessions in children with ADHD (r=0.814, p=0.001).

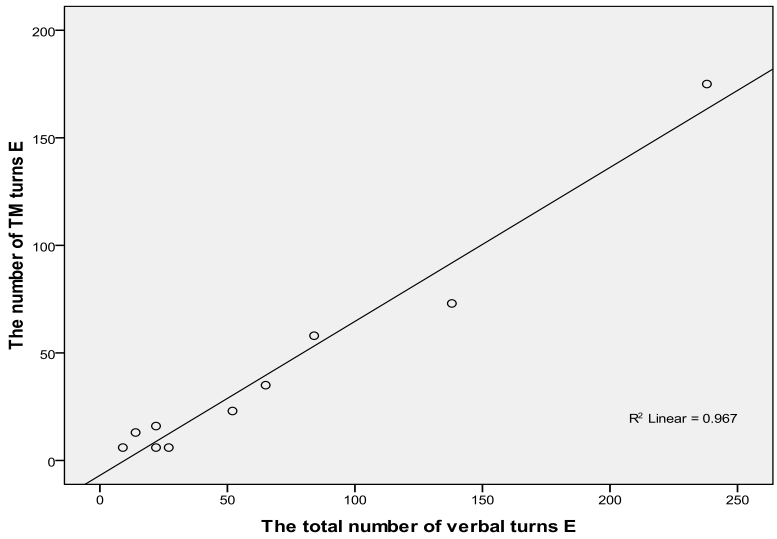


Figure 3.22 Scatter plot showing a best fit regression line with a significant positive correlation between the total number of verbal turns in the FI sessions and the total number of words in the FI sessions in children with ADHD (r=0.899, p=0.000).

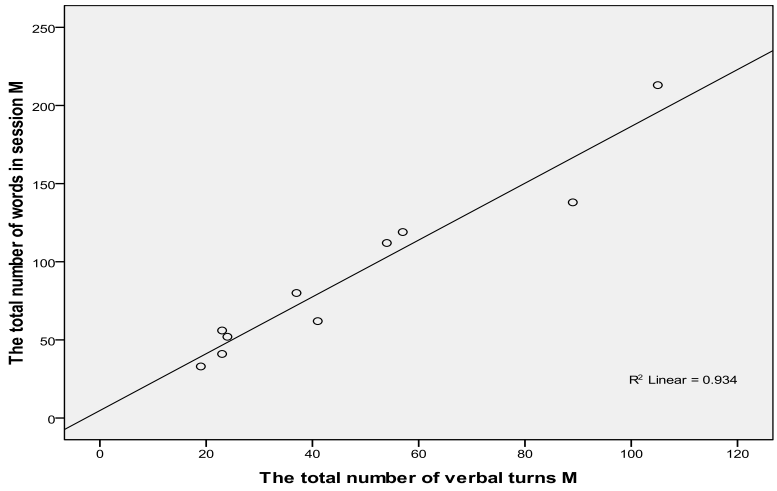


Figure 3.23 Scatter plot showing a best fit regression line with a significant positive correlation between the total number of verbal turns in the FI sessions and the average number of words per minute in the FI sessions in children with ADHD (r=0.899, p=0.000).

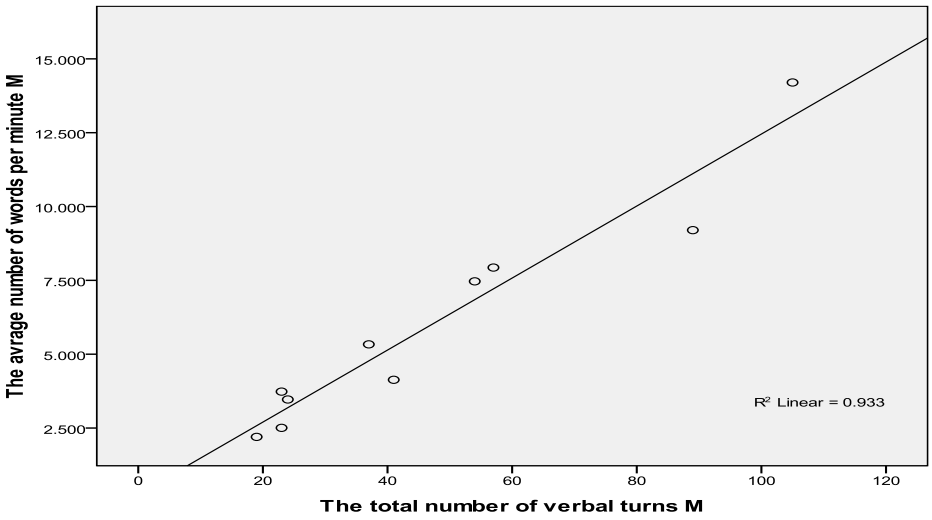


Figure 3.24 Scatter plot showing a best fit regression line with a significant positive correlation between the total number of verbal turns in the FI sessions and the number of topic initiation in the FI sessions in children with ADHD (r=0.750, p=0.003).

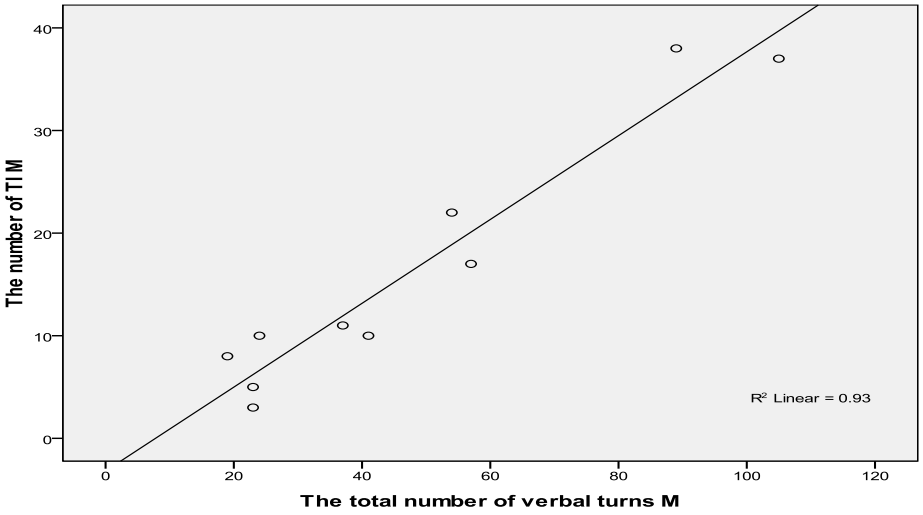
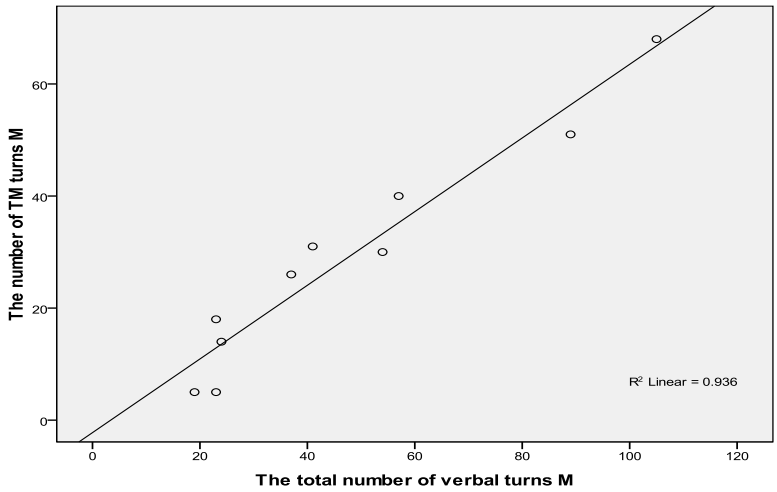


Figure 3.25 Scatter plot showing a best fit regression line with a significant positive correlation between the total number of verbal turns in the FI sessions and the number of topic maintenance turns in the FI sessions in children with ADHD (r=0.886, p=0.000).



3.18 Summary of Findings

In table 3.2 a summary of quantitative results of all participants are presented.

Table 3.2 Summary of quantitative results

Participant Number	Clinical Status	The total number of verbal turns UI	The total number of verbal turns FI	The total number of words in session UI	The total number of words in session FI	The average number of words per turn UI	The average number of words per turn FI	The average number of words per minute UI	The average number of words per minute FI	The number of TI UI	The number of TI FI	The number of TM turns UI	The number of TM turns FI	TI and TM ratio UI	TI and TM ratio FI
TD1	0	216	90	538	287	2.50	3.19	18.20	19.13	61	43	165	49	0.37	0.88
TD2	0	74	217	150	487	2.03	2.24	5.29	32.46	15	40	59	168	0.25	0.24
TD3	0	167	98	651	406	3.90	4.19	21.65	27.07	36	38	131	69	0.27	0.55
TD4	0	225	132	428	291	1.90	2.20	14.24	19.40	19	30	219	107	0.09	0.28
TD5	0	219	99	618	353	2.82	3.65	20.57	23.53	31	36	189	75	0.16	0.48
TD6	0	217	108	528	241	2.43	2.23	17.98	16.07	26	19	192	89	0.14	0.21
TD7	0	142	123	300	395	2.10	3.21	10.14	26.33	21	26	131	103	0.16	0.25
TD8	0	236	107	781	221	3.31	2.07	25.73	14.73	61	37	174	70	0.35	0.53
TD9	0	252	126	496	310	1.97	2.46	16.52	20.67	44	31	213	105	0.21	0.30
TD10	0	221	135	978	311	4.43	2.30	33.09	20.73	52	48	186	89	0.28	0.54
ADHD	1	22	37	31	80	1.41	2.16	1.03	5.33	6	11	16	26	0.38	0.42
ADHD	1	65	23	103	41	1.58	1.78	3.39	2.51	30	5	35	18	0.86	0.27
ADHD	1	238	105	795	213	3.34	2.03	25.58	14.20	62	37	175	68	0.35	0.54
ADHD	1	84	41	104	62	1.24	1.51	3.40	4.133	26	10	58	31	0.49	0.32
ADHD	1	138	57	228	119	1.65	2.09	7.35	7.93	65	17	73	40	0.89	0.43
ADHD	1	27	23	53	56	1.96	2.43	1.81	3.73	4	3	6	5	0.66	0.60
ADHD	1	14	24	25	52	1.79	2.17	0.91	3.47	2	10	13	14	0.15	0.71
ADHD	1	52	89	99	138	1.90	1.55	3.30	9.20	26	38	23	51	1.13	0.75
ADHD	1	9	54	10	112	1.11	2.07	0.33	7.47	4	22	6	30	0.67	0.73
ADHD	1	22	19	29	33	1.32	1.74	0.98	2.20	6	8	6	5	1.00	1.60

CHAPTER FOUR

The research questions that motivated this thesis asked if there were differences in verbal pragmatic skills between children with a diagnosis of ADHD and their typically developing peers that were matched in age and gender. The discussion chapter attempts to extend our understanding of verbal pragmatic skills in children with the diagnosis of ADHD at the quantitative level. The unique contribution of this thesis is that it provides evidence of verbal differences between ADHD and TD, especially in the reduced amount of verbal output in participants with ADHD compared to TD participants. The study also reiterated some previous findings related to the difficulties experienced by children with ADHD at the level of verbal pragmatics and contradicts others with regard to verbal pragmatic performance in children with ADHD. This chapter is structured to reflect the way that the results of the quantitative study were presented. The discussion of the quantitative research findings will begin with an examination of the outcomes of the hypotheses made for this study in section 4.1 followed by an interpretation of the findings and comparison with regard to the research literature in section 4.2. Finally, section 4.3 presents the conclusion.

4.1 Results of hypotheses

4.1.1 Hypothesis one

This hypothesis stated that the verbal output (as represented by the total number of words produced in a controlled session) of ADHD Arabic speaking 4-5 year old children is significantly less than that produced by typically developing children in the same age range. During the session with the UI, and also with the FI, ADHD subjects

showed a significantly lower total number of words compared to TD subjects, thus upholding this hypothesis.

4.1.2 Hypothesis two

This hypothesis stated that the total number of verbal turns is significantly greater when the children interact with a FI as opposed to a UI and that this difference is significantly greater for the children with ADHD. This hypothesis was not upheld; there was no significant difference in the total number of verbal turns between the UI session and the FI session either in the ADHD group or in the TD group.

4.1.3 Hypothesis three

This hypothesis stated that the verbal output as presented by average number of words per minute is significantly greater when the child interacts with a FI as opposed to a UI and that this difference is significantly greater for the ADHD Arabic speaking children. This hypothesis was not upheld; there was no significant difference in the average number of words per minute between the FI and the UI in the TD group or in the ADHD group.

4.1.4 Hypothesis four

In this hypothesis it was stated that the average number of words per turn produced in the session by ADHD Arabic speaking 4-5 year old children is significantly less than that produced by typically developing children in the same age range. During the sessions with the UI, and those with the FI, ADHD subjects showed a significantly

lower average number of words per turn compared to TD subjects, thus upholding this hypothesis.

4.1.5 Hypothesis five

This hypothesis stated that the children with ADHD would exhibit a higher ratio of topic initiation to topic maintenance than typically developing 4-5 year children in the sessions with the UI and with the FI. During the session with the UI, ADHD subjects showed a significantly higher topic initiation to topic maintenance ratio compared to TD subjects, however in the FI session there was no significant difference in the topic initiation to topic maintenance ratio, thus upholding this hypothesis with the UI sessions only.

4.2 Interpretation of the results

In this section the discussion of the results will be addressed in four major areas. The first relates to differences between ADHD and TD in verbal productivity as represented by the total number of words and the second deals with interlocutor impact as represented by the difference between the UI and the FI with respect to the total number of verbal turns and the average number of words per minute. The third addresses turns as represented by the average number of words per turn, and finally, the fourth relates to the ratio of topic initiation to topic maintenance.

4.2.1 Total number of words

The finding that the children with ADHD had greater verbal productivity than the TD children contradicts the Diagnostic and Statistical Manual Fourth Edition (DSM-IV, 1994) and the text revision (DSM-IV-TR, 2000) which state, without qualification, that the Child with ADHD "Often talks excessively" (See Figure 1.1). Comparing the participants' results in the current study showed that only one participant produce more than the TD average output. Accordingly, we can conclude that participants with ADHD talked considerably less than TD participants and the ranges hardly overlapped which would lead to an opposite conclusion from that stated in DSM-IV.

My findings are very different from those of previous research studies. Zentall (1988) found that children with ADHD talked less than TD children during elicited-language conditions but he also found that they talked more than TD children during free play. According to Zentall (1988) "it is rare to find a crossover of significant group differences (i.e., hyperactive children displaying significantly more behaviour than normal in one setting and significantly less than normal in another)" (Zentall, 1988, p.670) which I agree is unexpected but it provides evidence about the lower amount of verbal output during elicited-language conditions compared to free play. The methodological difference between Zentall's study and the current study which may have affected the results is that only the hyperactive subgroup was included in Zentall's study, however the ADHD subtype was not used as a criteria in the current study as there have been changes in the diagnostic criteria since it was DSM-III-R in Zentall's study and DSM-IV-TR in the current study. The age ranges are also different as in the current

study it is 4-5 years however in Zentall's study the range was 7-10 years. Sampling procedures also differ as in Zentall's study it was via examiner only using story telling techniques to elicit the sample and free play was only during the transitional periods between the story telling activities. However in the current study the sample was collected through free play interaction with the UI and FI.

The remaining three studies which measured verbal productivity (Copeland, 1979; Barkley et al., 1983; & Zentall et al., 1983; see section 1.6.1 for more details and discussions about those studies) all found it was greater in children with ADHD compared to TD children. Apart from sampling errors and age differences, the reasons behind this incompatibility must be methodological differences.

Copeland (1979) studied the types and amount of private speech in hyperactive boys compared to nonhyperactive boys (at the time of Copland's study the criteria for diagnosis was DSM-II which was mainly focused on hyperactivity symptoms) which was defined as "audible talking that is not addressed to another person" (Copeland, 1979: p.169). Each participant was brought individually into a playroom that was equipped with four age-appropriate games and he was allowed to play for three minutes in the room alone with no instructions about activity. It is a relatively short time. In Copeland's research the participant was not talking to anyone (audible self-talk) which raises a question about what is an appropriate approach to studying verbal productivity. However the difference in age range between Copeland's study (8.5 years) and the current study (age range 4-5 years) may also have affected the outcomes.

Zentall et al. (1983) studied the language and activity level in children with ADHD during five tasks and during the transition periods between tasks that was free interaction. The number of words, number of sentences, and the mean length of sentences were measured and the children with ADHD were more verbal than TD children in all conditions. The mean age was 72.7 months for the 26 subjects (13 ADHD and 13 controls). Comparing Zentall et al.'s research with the current study revealed a wider age range in Zentall's study (3:10 to 7:5 years) which may have affected the results. The findings reveal inconsistency between Zentall's studies of 1983 (ADHD are more verbal than TD) and 1988 (children with ADHD talked less than TD children during elicited-language conditions but he also found that they talked more than TD children during free play). These may have been caused by methodological differences by using storytelling and retelling in 1988 study but referential communication tasks and free interaction during transitional periods in 1983 study. The age difference of 3:10 to 7:5 in the 1983 study is very different to the children of 7 to 10 years used in the 1988 study. The changes in the diagnostic criteria may also have affected sampling as between DSM-III (Attention-Deficit Disorder, ADD) with or without hyperactivity stood in 1983 and the 1988 study used DSM-III-R that identifies attention-deficit hyperactivity but with a single diagnosis without subtypes and undifferentiated ADD.

Barkley et al. (1983) found that children with ADHD talked more than TD children during free play of 15 minutes. Barkley et al.'s study is also different from the current study in the age range (mean age in Barkley's study was 9.25 years vs. age range 4-5 years in the current study). However the question remains about why the findings

are so different.

I believe that the research community needs to revisit the hypothesis of excessive talk in children with ADHD. All the previous empirical studies are relatively old. One possible factor is the changes that evolved in diagnosing ADHD between the DSM-III and DSM-IV (see section 1.2.1.1 for more details). Also, the feedback that I received after my presentation of these findings at the ASHA convention, Philadelphia 2010 from a speech-language pathologist was that "ADHD verbal output is less and not as mentioned in textbooks." The results of the current study provide evidence that children with ADHD's verbal output is lower than that of TD children in the same age range.

4.2.2 The interlocutor impact.

In the current study the results revealed that the total number of verbal turns and the average number of words per minute in the children with ADHD was significantly lower when compared to TD children in the UI sessions as well as in the FI sessions. Comparing the participants' results during the interaction with the UI showed that seven participants out of ten with ADHD produced less total number of verbal turns and average number of words per minute than the minimum found in the TD participants. Also, nine participants out of ten with the ADHD produced lower total number of verbal turns than the minimum found in the TD participants and all participants with ADHD produced a lower average number of words per minute than the minimum found in TD during the interaction with the FI. It is important to highlight that the total number of verbal turns and the average number of words per minute in the UI and the FI conditions

separately are in the same direction as the findings discussed in the previous section (verbal productivity) which is another measurer of the lower amount of verbal productivity in the children with ADHD than the TD children. However, the between-group comparison showed no significant difference between the UI and the FI sessions in either the ADHD group or the TD group at the level of the total number of verbal turns or the average number of words per minute. It was predicated that children with ADHD would be more sensitive than TD to the interlocutor factor but the results of the current study showed that the children with ADHD are not different from TD children in terms of the difference between UI and FI sessions.

According to Scott and Taylor (1978) who examined the influence of sampling condition (clinical setting with clinician and home setting with mother) in 3-6 year-old TD children, the older ones were more influenced by sampling condition than the younger children. The hypothesis regarding the difference between the children with ADHD and the TD children may be valid with older ages than with the age range of the present study. Also, this does not mean that there is an absence of difficulties during interaction between children with ADHD and their mothers (FI) or during interaction with the examiner (UI). It is important to mention that the literature has shown that children with ADHD have difficulties in interactions with their parents (Johnston & Mash, 2001) and it has also been hypothesized that problems in parent-child interactions are associated with exacerbations or a continuation of ADHD symptoms (Barkley, 2000) which we can extend to the UI-child interaction based on the results of the current study.

It was observed that during the UI and FI sessions with the children with ADHD, some interlocutors, especially mothers, were sitting quietly watching the children with ADHD playing, without trying again to communicate after a communication failure. This is consistent with previous studies (e.g., Cunningham & Barkley, 1979; Mash & Johnston, 1982) that investigated parent–child interaction patterns in families of children with ADHD compared to TD children. They consistently demonstrated that (a) children with ADHD are less compliant and more negative in parent–child interactions and (b) their parents use more commands, more negative statements, and less praise. Also, the ADHD mothers in our study may have expected less out of them at the verbal level. Thus, there were some long pauses between communicative acts that although not measured in the present study, may have had an impact on results. This is important because it shows the possible effect of ADHD on the verbal interaction pattern compared to TD children. On the other hand, the TD children were obviously more verbal quantitatively in terms of number of words produced during the UI and the FI sessions. The research community needs to investigate the interlocutor impact on the amount of verbal interaction in children with ADHD because the previous research studies did not pay enough attention to the quantitative aspect represented by the total number of verbal turns and the average number of words per minute.

4.2.3 The average number of words per turn.

The average number of words per turn produced in the session differentiated participants with ADHD from TD participants in a way that showed evidence of weak discourse skills in children with ADHD. Comparing the ADHD and TD participants'

results showed that eight participants out of ten with ADHD produced less than the minimum found in the TD participants during interaction with UI. Five participants out of ten with ADHD produced less than the minimum found in the TD participants during interaction with FI. All participants with ADHD produced a lower number of words per turn than the maximum found in the TD participants in both interaction sessions with UI and FI. The vast majority of the ADHD answers were single words. Accordingly, we can conclude that participants with ADHD talked considerably less using shorter sentences than TD subjects and the ranges hardly overlapped. It is also important to mention that it was observed that the interruptions during conversation with the UI and the FI by participants with ADHD were more than those by the TD subjects, which is consistent with the DSM diagnostic criteria for ADHD. According to Ervin-Tripp (1979) children at the age of two can maintain a topic during interaction with an adult and show competency in using turn-taking repairs by the age of five years. Speaking specifically about turn taking skills, this shows stabilization between the age of two and half to three and half years. All previously mentioned difficulties are expected to have a direct impact on the verbal language use skills of children with ADHD.

4.2.4 Topic initiation to topic maintenance ratio.

In topic initiations, the results showed that the number of instances of topic initiation in the session with the UI and the FI in participants with ADHD was not significantly different compared to TD participants. However, as regards topic maintenance, the results showed that the number of instances of topic maintenance in the

session with the UI and the FI in the ADHD group was significantly lower when compared to the TD group. This implies that the core behavioural characteristics of ADHD (i.e., inattention, impulsivity, and hyperactivity) have more impact on topic maintenance skills than on topic initiation skills in children with ADHD.

According to Brinton and Fujiki (1984) the number of topic initiations decreases with age. However the number of instances of topic maintenance increases with age. Also, they reported that a 5-year-old child should be able to maintain topics for an average of five utterances which is consistent with the TD sample in the current study. In the current study, the children with ADHD could not maintain the same topic for more than two utterances. This conversational behaviour may impede the child from continuing with the targeted conversational topic. According to Owens (2009), a child with pragmatic impairment usually has limited topics or perseverates on a few topics regardless of the context.

Regarding the topic initiation to topic maintenance ratio, the results showed that the topic initiation to topic maintenance ratio in the session with the UI in the ADHD group was significantly higher than that of the TD group. However, there was no significant difference in topic initiation to topic maintenance ratio in the session with the FI in the ADHD group compared with TD group. In the between-group comparison there was a significant difference in the topic initiation to topic maintenance ratio between the UI session and the FI session in the TD group, while there was no significant difference in the ADHD group. These findings indicated that the participants with ADHD had more topic initiations than topic maintenance compared to TD participants. Participants with

ADHD are suggested to be less sensitive to the interlocutor change. Children with ADHD have been reported to miss verbal, nonverbal, and situational cues and to fail to notice social context (Kim and Kaiser, 2000). The most inappropriate pragmatic behaviours observed in the children with ADHD included inadequate or absent feedback to the interlocutor, less or absent responses to requests or questions by an interlocutor, frequent interruptions to the interlocutor, frequent unspecific vocabulary use, limited ability to maintain topic, and lack of cohesion. The results of the current study are compatible with the Humphries et al. (1994) study that concluded children with ADHD exhibit difficulties in maintaining a conversation but not in initiating a conversation. Other studies such as Tannock and Schachar (1996) have also mentioned topic maintenance as one of the main pragmatic problems in ADHD.

4.3 Conclusion

According to the DSM-IV-TR diagnostic criteria for ADHD, a child with ADHD often does not seem to listen, does not follow through on instructions, is easily distracted by extraneous stimuli, and interrupts others. The reduced amount of verbal output, the failure to give appropriate feedback to the interlocutor, inappropriate responses to requests or questions by the interlocutor, and shorter turns that were produced by the children with ADHD in the current study verify the inattentive and impulsive behavioural characteristics of children with ADHD. We can conclude that the core behavioural characteristics of ADHD (i.e., inattention, impulsivity, and hyperactivity) may contribute to the pragmatic difficulties of children with ADHD. To provide more explanations of

the difficulties experienced by the participants with ADHD in the current quantitative study, a further qualitative investigation was administered. It is reported in chapter five.

PART TWO

CHAPTER FIVE

This chapter begins with an introduction regarding the rationale behind the qualitative study and a review of the research literature in section 5.1 followed by the purpose of the study and research questions in section 5.2. A description of the research methodology in section 5.3 is followed by the results and a discussion and interpretation of the qualitative analysis outcomes in section 5.4. Finally, the conclusion of the qualitative study is presented in section 5.5.

5.1 Introduction and literature review.

In chapter one a review of relevant studies that investigated verbal pragmatic skills in children who have a diagnosis of ADHD was presented. In those studies a variety of methodological approaches, including qualitative and quantitative had been used. The results of the quantitative study in the current research showed lower verbal productivity, shorter turns, and difficulty with topic maintenance during the interlocutor-child interaction (i.e., UI and FI) in the participants with ADHD compared to TD participants. Also, the children with ADHD were not different from TD children in terms of sensitivity to interlocutor familiarity during the verbal interaction with the FI and the UI. This chapter reports the method and findings of a subsequent qualitative investigation into the reasons why this should be the case.

Children who have the diagnosis of ADHD present as a heterogeneous group, which makes it difficult to clearly discern facts about the pragmatic ability of children with ADHD. However some previous studies (Tannock et al., 1995; Purvis & Tannock,

1997; Kim & Kaiser, 2000) reported that children who have been diagnosed with ADHD have greater difficulties with the organization of discourse, managing complexity, and more negative behaviour associated with language compared to typically developing children. Adams (2002) claimed that to study the child's verbal pragmatic abilities it might also be required to pinpoint the interlocutor behaviours that facilitate communication.

It is generally found that children with ADHD do not lack interest in contact with other people, but often have difficulties in attuning their behaviour to other people (Nijmeijer et al., 2008). Those difficulties affect their verbal behaviour negatively in qualitative as well as quantitative ways. The complexity of children's expressive language as a qualitative measure has been used in some studies. Zentall (1988) and more recently Redmond (2004) studied the number of different words in narratives as a measure of lexical diversity and reported differences in the outcomes for children with ADHD compared to the typically developing children. Measures of lexical diversity may be sensitive to complexity in language because lexical diversity indicates an attempt by the speaker to vary the overall wordings that are used within the conversation. Redmond (2004) used mazing (instances of repetitions, revisions, restarts, and the use of fillers) as an indicator of utterance formulation difficulties, and included mazes in his array of measures of language impairment. He noted that increased mazing differentiated the children with ADHD from typically developing children. A qualitative approach in processing the recorded audio-visual data may help in answering questions about the complexity of verbal responses in children with ADHD compared to TD children during

the child's interaction with their mothers and better understanding for the possible reasons behind the differences in verbal productivity.

The previous research literature was not so clear or direct when it comes to the influence of the interlocutor differences on children with ADHD. However, mother-child interaction has long been one of the major areas of research in speech and language development and disorders. Bedrosian et al. (1988) pointed to the continuing facilitative role of mothers in guiding the development of their children's pragmatic skills. Added to that, Anderson et al. (1994) pointed out the reciprocal relationships between ADHD characteristics and familial factors (i.e., mother interaction style). Accordingly, it was decided to investigate mother-child interaction in the present study. Despite extensive literature on ADHD, relatively little emphasis has been placed on an objective analysis of children with ADHD interacting with their mothers. Most research, in contrast, has emphasized the ADHD characteristics, behaviours, and abilities of children with ADHD in comparison to typically developing peers. The effects of the child's ADHD symptoms on parental behaviour have received some attention in research studies. In Cunningham's study (2007) it is claimed that the behaviour of the child can affect the quality of parenting. Also Johnston and Mash (2001) reported that children with ADHD often ignore parental requests and elicit negative reactions from caregivers.

Most studies have focused on the interactions between mothers and their children and conversational repairs from the mother's side. Conversational repair includes detection and reaction to conversational breakdowns by the child. ADHD mothers tend

to be more controlling and disapproving of their children according to Cunnigham and Barkley (1979). Mothers of children with ADHD frequently give attention to overactive and impulsive behaviour (Mash & Johnston, 1982). They give more verbal direction, repeated commands, verbal reprimands, and correction than mothers of TD children. They are also less rewarding and responsive than parents of TD children (Barkley, Karlsson, & Pollard, 1985; Befera & Barkley, 1984; Mash & Johnston, 1982; Tallmadge & Barkley, 1983). According to Cunningham and Barkley (1979) in the interactions of children with ADHD with their mothers, the behaviour of each member of a dyad is influenced by the behaviour and responses of the other individual. The mother's behaviour serves as a stimulus to which the child responds. Also, the child's behaviour acts as an antecedent to various responses from the mother. The responses of the mother and the child are further modified by the subsequent responses of the other individual. Therefore, the verbal interactions of the mother and the child with ADHD must be studied rather than the independent responses or unilateral effects of either individual. Theorists have argued that patterns of parenting behaviours are more strongly related to the child behaviours than are discrete parenting behaviours (Johnston & Wong, 2002). One of the most consistent themes in the research literature is the way in which mothers tend to direct interaction with their atypical language-learning children (Conti Ramsden, 1994; Conti Ramsden & Perez Pereira, 1999). This may result in parents trying to teach rather than support language development (Brown & Remine, 2004). It has also been suggested that the dominance on the part of the parents may reflect the parents' extra effort to establish joint attention rather than assuming a directive role on purpose (Jamieson, 1994). Tannock (1988) claimed that mothers' controlling of their children's

interaction could be divided into three aspects: response control (mothers' use of commands and questions to elicit response from the child); topic control (mothers' tendency to redirect the child to another topic); turn taking control (mothers' tendency to make frequent or prolonged turns).

5.2 Purpose of the study and research questions

The purpose of this study was to investigate the mother-child (FI-child) interactions in the children with ADHD compared to the TD children using a qualitative perspective with respect to conversational contributions and repair by the mother and the complexity of responses from the child during the interaction in the recorded sessions. The qualitative analyses enable discussion of the clinical distinguishing characteristics in the participants with ADHD, which could provide further understanding of the difficulties experienced by the participants with ADHD.

The research questions were:

1) What is the difference between the children with ADHD and the TD children, with respect to complexity of responses?

2) What is the difference between the mothers of children with ADHD and the mothers of TD children, with respect to conversational contributions and repair?

5.3 Methodology

A qualitative approach to analyzing the same recorded data as that used in the quantitative study was undertaken in order to answer the research questions of section 5.2, above. To investigate conversational repairs by the interlocutor and the complexity of the responses from the child in the audio-visual recorded data, all speech dyadic interactions were orthographically and verbatim transcribed and that was followed by analysis, including the use of a coding system. There are several available procedures that are suitable for analyzing conversational samples (Perkins, 2007; Adams & Bishop, 1989). Gardner and Forrester (2010) described conversation analysis procedures that have been used for much more fine-grained qualitative analysis, and have frequently been used for single cases and small cohorts. Putting and Kirchner (1987) described an analysis in which a participant's contribution to 15 minutes of spontaneous conversation with a familiar partner is coded for several target behaviours. The target pragmatic behaviour is rated simply as either present or absent. This approach has been valuable in research studies which are relevant to the current research study. The coding of Kim and Kaiser (2000) has been replicated to form the majority of the coded utterances while the addition of mazes has been made based on the work of Redmond (2004). See chapter two for more details about criteria, recruitment, data collection, and setting.

5.3.1 Participants and data

Only the FI-child sessions were analyzed in the qualitative study. The language sample of ADHD and TD participants during interaction with FI was transcribed and coded by the researcher using transcription codes (See Appendix C). Examples

included in this thesis have been translated into English. Every attempt was made to ensure that the transcripts accurately represented the participant's verbal interaction and repeated listening was used alongside inter-rater reliability for the coding structure. Any parts that were unintelligible were designated on the transcripts as being unintelligible and were not considered for any further analysis. The total number of minutes that was transcribed and analyzed was 300 minutes (15 minutes each with 10 participants with ADHD and with 10 TD participants).

5.3.2 Conversation coding and analysis

The samples were transcribed by the author. Each mother or child turn was entered in a separate line for easier identification. A turn was defined as an interval filled by one or more words by one speaker. Coded data was compared one by one for all targeted verbal behaviours from the FI or the child during their interactions.

5.3.2.1 FI's interaction

The codes applied to the FI's verbal interactions were "non-verbal cues", "questions", "rephrase", "repetitions", "comments", and "command". The use of the following non-verbal cues was recorded: pointing, using hand gestures or presenting an object to accentuate the spoken words or substitute them in conveying the meaning (Example: "You mean that one / at the same time the mother points to the yellow car". Questions were coded according to whether they were 'choice', 'yes/no' or 'wh-' questions. examples would be as follows.

Choice: Offering a choice between two alternatives, for example "Want to play with car

or bubbles?"

Yes/No: Offering a single option, for example "Do you want to play with the car? ". Note that in Arabic, as in English, Yes/No question can be asked by saying words or a phrase with a rising intonation, as in “More?” and “ All done? ”.

Wh-question: questions that start with “what”, “who”, “where”, “when”, “why” or “how”, for example "Where is the red car? ".

A "Rephrase" code was used for when the FI reworded a preceding utterance, for example "that one.. yes I mean the doll."

A "Repetition" code was used for when the FI repeated what was said one or more times in order to establish and/or maintain communication, for example "car.. car.. car.. yes this is the car."

A "Comment" code was used when the interlocutor commented on what the child was doing or saying, for example “yes it nice and big car, I really like it."

A "Command" code was used when the interlocutor made a request for action, for example "LOOK!"

Interjections (e.g., ‘mmm’) or other non-words, were not counted in the current analysis.

5.3.2.2 Child’s interaction

The codes applied to the complexity of responses from the child during the interaction with FI were: “no verbal response”, “single word production”, “multi word production”, and “maze”.

The “no verbal response” code refers to the child failing to respond at all to an initiation from the FI (i.e., a silent interval while the FI waited for a response, after which the FI tried again to elicit a response).

A "Single word production" was any verbal production that contained one single word.

A "Multi word production" was any verbal production that included more than one word.

A "maze" was any false start, repetition, or reformulation. When maze words are removed from the utterance, the remaining words can stand alone.

The outcomes for the previously mentioned variables in the outputs of child participants or FI participants were managed descriptively. The targeted behaviours were included because they had been identified as important by previous research. Furthermore, their inclusion was felt to be consistent with the intention of the study to describe in detail the resources of mother-child interaction in children with ADHD compared to the TD peers.

5.3.3 Inter-observer reliability

To estimate inter-observer reliability, two qualified speech and language pathologists independently re-transcribed and recoded 10 minutes of two randomly selected sessions, one ADHD and one TD using the same coding protocol. Recoded data sheets were compared item-by-item with the researcher's coding sheets. An inter-observer agreement was calculated by dividing the number of agreements between the researcher’s codes and the two speech-language pathologists’ codes by the number of

agreements plus disagreements and then multiplying by 100. For all targeted verbal behaviours agreement with first coder was 96% and the agreement with the second coder was 97%. The kappa coefficient was calculated on the relationship between the researcher's codes and those of each of the other two coders. The results revealed a high level of agreement; it was found that the kappa coefficient was 0.95 in the case of the first coder and 0.96 in the case of the second coder, which is almost perfect agreement in all coding areas.

5.4 Results and discussion

The discussion will first address the performance of participants with ADHD compared to TD participants during interaction with the FIs (in section 5.4.1, below) and then it will address the differences between the FI interaction patterns with participants with ADHD compared to the FI interaction patterns with the TD participants (In section 5.4.2, below).

5.4.1 Child participants

In the current study, the children with ADHD displayed several behaviours that could be interpreted as different from TD at the quantitative and qualitative levels. We have found verbal skills to be more challenging for children with ADHD relative to their unaffected peers. In terms of child participants, the current study investigated and compared differences in the children with ADHDs' complexity of responses during interaction with FI in comparison to the TD's complexity of responses during interaction

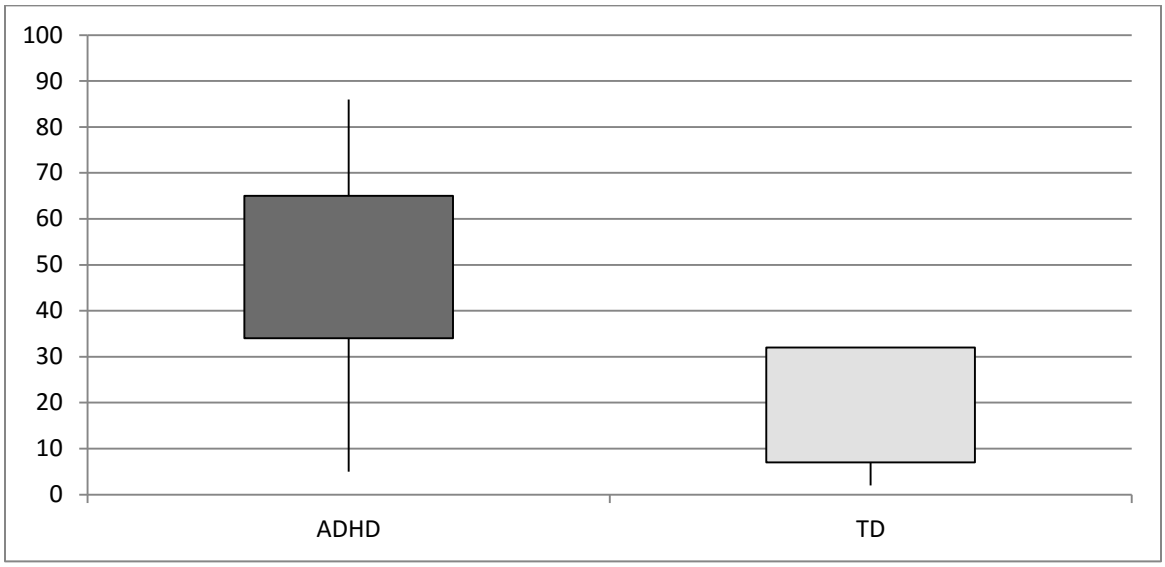
with the FI. The investigation included four parameters: “no verbal response”, “single word productions”, “multi word productions”, and “mazes”.

5.4.1.1 No verbal response

The instances of “no verbal response” occurred more during ADHD-FI interactions than TD-FI interactions (see figure 5.1 for the instances of “no verbal response” during ADHD-FI and TD-FI interactions). The “no verbal response” range during ADHD-FI interactions is 5-86 however the range during TD-FI interactions is 2-32. In the participants with ADHD, we might link the reduced verbal output with the greater number of “no verbal responses” instances. Also, in TD the reduced amount of no verbal responses might link to the greater verbal productivity. We can claim that the incidence of “no verbal response” is highly associated with the amount of verbalization. The reason for children with ADHD to exhibit a greater number of “no verbal response” than TD during their interaction with FI is possibly related to the ADHD symptoms and verbal behaviours that were presented in the research overview in detail in chapter one, namely more avoidance of tasks, less compliance, more off-task behaviour and less regard for turn-taking than TD children. The other possible reason for this behaviour might be the difficulties that children with ADHD have in language use. They display this difficulty in their interactions with FI by avoiding verbal interaction with the FI and therefore exhibit “no verbal response” more frequently in comparison to TD participants. In the figure 5.1 the box plot is used, the box represents the inter-quartile range (between the 25^{th} and 75^{th} percentiles) which contains 50% of the data, while the whiskers

represent the minimum and maximum values. See figure 5.1 the same format is used; in figures 5.2, 5.3, 5.7, 5.8, and 5.9.

Figure 5.1 The incidence of "no verbal response" during ADHD-FI and TD-FI interactions



5.4.1.2 Single and multi-words productions

Participants with ADHD relied more on using single word productions in their verbal interactions with the FI than using multi-word productions. No participant with ADHD showed usage of multi-word productions more than single word productions. Also, it was noted that three participants with ADHD did not use multi-word production at all during their interaction with the FI, two participants with ADHD only used it a single time, and one Participant with ADHD used such an utterance twice (see figure 5.2). The situation is totally different in TD participants who used multi-word productions more than single word productions during their interactions with the FI.

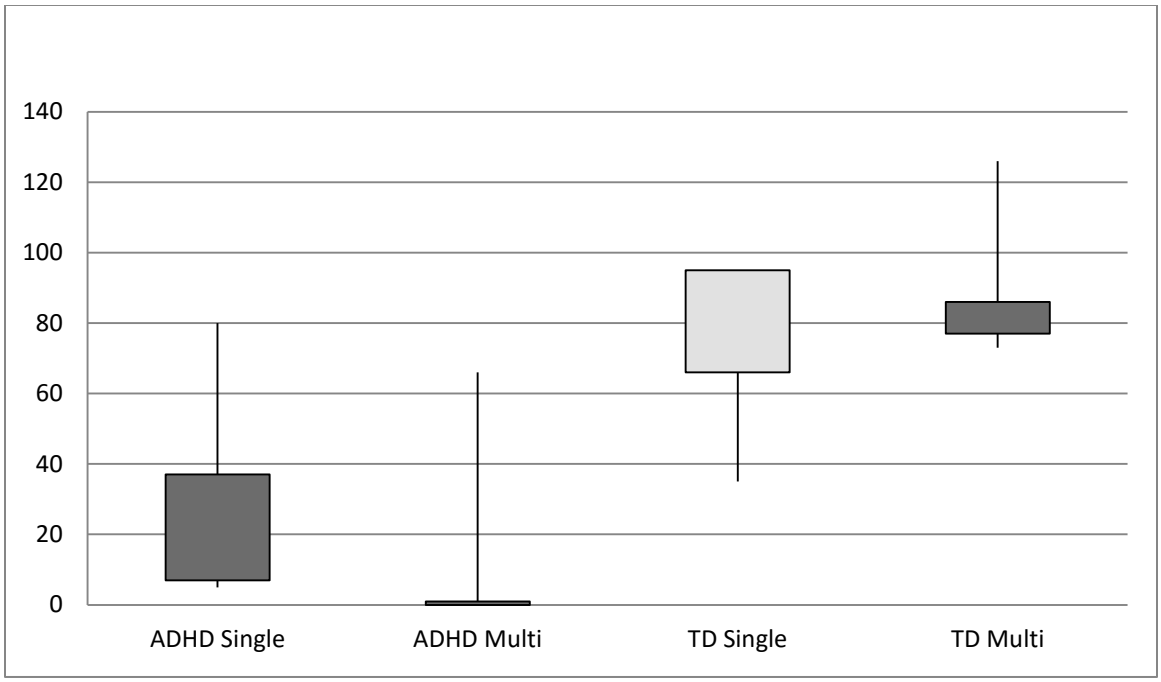
Multi-word production use was greater than single word production use in nine TD participants out of 10. The differences between ADHD and TD participants' usage of multi-word productions not only can be displayed at the numerical level but also qualitatively. The average number of words per turn and sentences length were shorter amongst the participants with ADHD than the TD participants during the interaction with FI. It was observed that the participants with ADHD used anaphoric and deictic words (e.g., "this") more frequently than specific words in comparison to TD participants. Also, the participants with ADHD produced less syntactically and semantically complex forms in comparison to TD participants.

Sample 1

Mama play with our? ماما نلعب معانا؟

In sample 1, the child with ADHD is inviting his mother to play with him but the child is using an incorrect pronoun morpheme that is attached to the verb. He is using the morpheme that refers to present tense and plural whereas he should have used the morpheme that refers to the future and singular. Also, the pronoun that is attached to 'with' is plural although he is referring only to himself. The effects of those difficulties were reflected on the semantic and syntactic levels.

Figure 5.2 Single word and multi-words productions from children with ADHD during ADHD-FI sessions and from TD children during TD-FI sessions

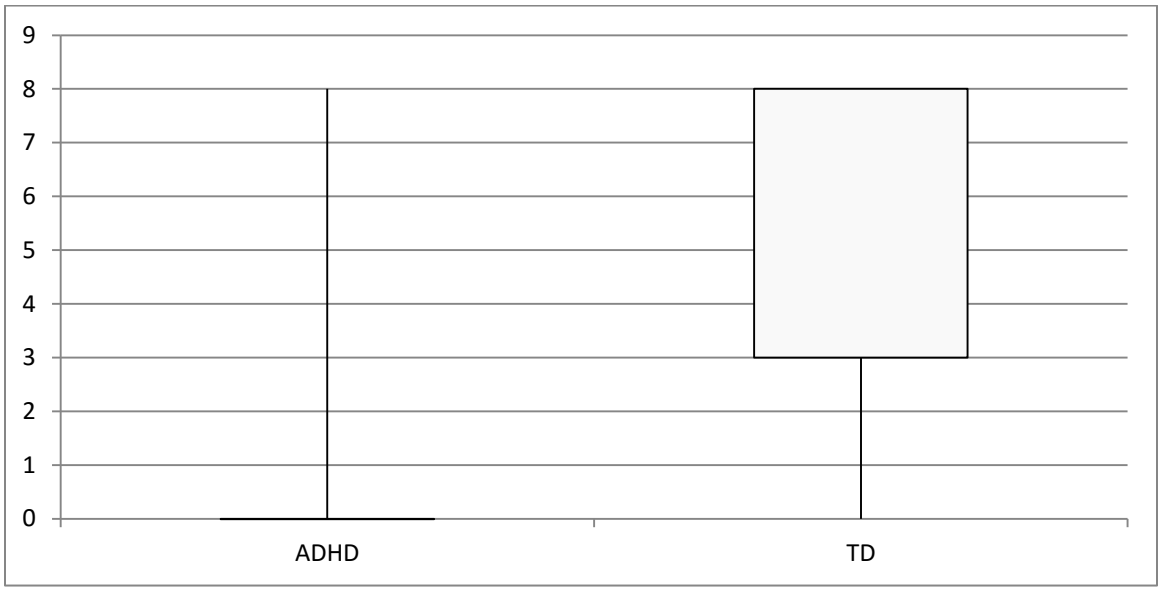


5.4.1.3 Mazes

Mazing, which is thought to be indicative of language formulation difficulty if it occurs frequently, has been reported in the literature. Redmond (2004) reported that children with ADHD used significantly more mazes and longer mazes than typically developing children. In contrast with Redmond's (2004) results, mazes did not differentiate the children with ADHD from the TD children. However the numerical difference in the occurrence of mazes in ADHD-FI compared to TD-FI is possibly misleading due to the reduced verbal output in children with ADHD in the current study, allowing fewer opportunities for mazing to occur. Only one child with ADHD exhibited

mazes during interaction with FI. This was ADHD3 who exhibited the highest incidence of multi-word productions among the children with ADHD during their interaction with the FI (8 instances of mazes in 66 multi-word productions) however the range of mazes in TD children was 0-8 as presented in figure 5.3. Accordingly, we can tentatively conclude that mazing is not useful for distinguishing the language of children with ADHD from the language of TD children.

Figure 5.3 Mazes in the children with ADHD and TD children during their interactions with FIs.



5.4.1.4 Observations on the child's participation

Figures 5.4 and 5.5 provide examples of some of the typical differences between an ADHD and TD participant during verbal interaction with the FI in this sample. First we will consider our broad measure of difference, that of word count. In Figure 5.4, the

Participant with ADHD showed less verbal productivity compared to the TD sample in figure 5.5. The average number of words per turn and individual utterance length were shorter in the Participant with ADHD than the TD participant. Also, the participants with ADHD produced less syntactically and semantically complex forms in comparison to TD participants and it was mainly single words (6, 14, 16, 18, 22, 26), falling below the child's most sophisticated output. The child with ADHD in figure 5.4 was able to respond to questions (6, 14, 16, 18) but does not always acknowledge requests for answering questions (19, 20, 21 / 22; 23, 24, 25 / 26). There are several possible explanations for this limitation. In ADHD, actual linguistic formulation limitations may be masked by reduction of engagement and verbal output. The child with ADHD may alternatively (or in addition) limit verbal engagement by keeping the conversation on familiar topics and using short sentences due to the challenges of listening and interacting with the FI interlocutor.

In a conversational situation with FI, the children with ADHD displayed more inappropriate pragmatic behaviours than TD children. Children with ADHD often did not respond to requests or questions from their mothers (FI) and rarely used multi-word productions but they mainly relied on single word productions in the conversation during their interactions with the FI. They gave less feedback to the FI and used non-specific vocabulary. The findings of the current study were similar to those of Kim and Kaiser (2000) who claimed the children with ADHD showed less appropriate pragmatic behaviours and produced more inappropriate pragmatic behaviours than typically developing children. The inappropriate behaviours in Kim and Kaiser's study included no response to questions or requests, overlap, less feedback to the speaker, unspecific

vocabulary use, and lack of cohesion. Whalen and Henker (1985) reported that the behavioural characteristics of the children with ADHD such as short attention span and insensitivity to social cues might contribute to pragmatic difficulties in children with ADHD. Also, they added that children with ADHD have been reported to miss verbal, non-verbal, and situational cues and fail to notice social contexts, which is in harmony with the diagnostic criteria of ADHD given in DSM-IV-TR: the child with ADHD often does not seem to listen when spoken to directly and does not follow through on instructions. Also, the child with ADHD is often easily distracted by extraneous stimuli. So, the results with respect to the language of the children with ADHD in the current study accord with the behavioural characteristics of ADHD.

Figure 5.4 Sample of an interaction between a FI and participant with ADHD.

- Each turn was numbered for easier identification for mother (FI), typically developing child (TD), or (ADHD).
- All translations are as literal as possible and therefore not always grammatically correct English.

- Everything the mother said is in **Red** under (FI).
- Everything the Attention Deficit Hyperactivity Disorder (ADHD) participant said is in **Blue** under (ADHD).

(FI)				*الأم*
1	What is this?	إيش هدا؟	*1*	
2	Ahmed what is this	أحمد إيش هدا؟	*2*	
3	See what is this?	شوف إيش هدا؟	*3*	
4	What is the name what is the name?	إسمة إيش اسمة إيش؟	*4*	
5	Speak	اتكلم	*5*	
ADHD				*الطفل*
6	Box	صندوق	*6*	
7	I will take this	حاخد هادي	*7*	
8	Put it here	أحطها هنا	*8*	
9	All down	كلة طاح	*9*	
(FI)				*الأم*
10	What is the color of the car?	إيش لون السيارة؟	*10*	
11	This one Tell me the color?	هادي إيش لونها؟	*11*	
12	What is the color?	إيش لونها؟	*12*	
13	What is the color?	إيش لونها؟	*13*	
ADHD				*الطفل*
14	White	أبيض	*14*	
(FI)				*الأم*
15	And this one	وهادي	*15*	
ADHD				*الطفل*
16	Green	أخضر	*16*	
(FI)				*الأم*
17	And this one	وهادي	*17*	
ADHD				*الطفل*
18	Red	أحمر	*18*	
(FI)				*الأم*
19	And this one	وهادي	*19*	
20	What is the color	إيش لونة؟	*20*	
21	Fluorescent yellow	فسفوري	*21*	
ADHD				*الطفل*
22	Fluorescent yellow	فسفوري	*22*	
(FI)				*الأم*
23	And this one	وهادي	*23*	
24	And what is this?	و هادي اية؟	*24*	
25	Yellow	أصفر	*25*	
ADHD				*الطفل*
26	Yellow	أصفر	*26*	

Figure 5.5 Sample of interaction between a FI and TD participant.

- Each turn was numbered for easier identification for mother (FI), typically developing child (TD), or (ADHD).
- All translations are as literal as possible and therefore not always grammatically correct English.

- Everything the mother said is in **Red** under (FI).
- Everything the Typically Developing participant said is in **Blue** under (TD).

(TD)				الطفل
1	See what I did	شوفي إيش سويت	1	
(FI)				الأم
2	Who is this?	مين هدا؟	2	
3	Who is this?	مين هدا؟	3	
(TD)				الطفل
4	Him	هو	4	
(FI)				الأم
5	What is his name?	إيش إسمة؟	5	
(TD)				الطفل
6	I do not Know	ما أدري	6	
7	We play with that and we play bubbles	لعبنا بهادا ولعبنا بابلز	7	
(FI)				الأم
8	You played bubbles	لعبتوا بابلز	8	
(TD)				الطفل
9	Yes	أيوة	9	
10	She is having a lot shapes	عندها كل الأشكال	10	
11	I want to do that	أبغي أسوي هادا	11	
12	We hide the treasure and it was big, she told me no one is seeing you but I said except me, She asked me if I know where it is, she said I Need to count tell ten and after I counted I am The winner. She give me a candy	خبينا الكنز وبعدين هناك كبير وهي قالتلي مأحد شافك قلتلها ناقص أنا وبعدين قالتلي طيب بعدين قالتلي ماتعرف فينة قالتلي ماتعرف فينة قالت خلاص لازم أعد إلين عشرة وبعد ما عديت إلين عشرة أنا الفايز وإديتني حلاوة علشان أنا فزت	12	
13	She has a lot here	عندها هنا كتير	13	
14	One-26	واحد- ستة وعشرين	14	
15	Now we can turn it on, it was not working? Correct?	دلحين نقدر ندورها أول خربانة صح	15	
(FI)				الأم
16	Lollipop	مصاص	16	
(TD)				الطفل
17	Yes	أيوة	17	
18	You want me to show you this	أوريكي هادي	18	
(FI)				الأم
19	At home it is not bad, all what it needs is batteries	فين في البيت موخربانة يبغالها بطارية	19	
20	You want to turn it on?	تبغي نشغلها ؟	20	
21	Only bring batteries and we can turn it on	نجيبلها بطارية بس ونشغلها	21	

5.4.2 Familiar interlocutor (FI) participants

It is widely known that children with ADHD can have difficulties in interactions with their mothers (Johnston & Mash, 2001). It has also been hypothesized that problems in parent-child interactions are associated with exacerbations or continuation of ADHD symptoms (Biederman et al., 1996; Barkley, 1998). In terms of mothers (FI participants), the current study investigated and compared differences in the FIs' conversational repair during interaction with their children with ADHD in comparison to the FIs' conversational repair during interaction with TD children. The investigation included six parameters; use of non-verbal cues, questions, rephrasing, repetitions, comments, and commands.

In this data the amount of verbalization that is required from the mother (FI) to stimulate verbal interaction from the participants with ADHD is much more in quantity compared to that required in the case of the TD participants. Also, the FI of children with ADHD participated with more turns in the conversations with their children than FI of TD children in the current study which is in harmony with the results of the quantitative study that showed less verbal productivity and less total number of turns during dyadic conversations in FI-ADHD interactions compared to FI-TD interactions. A possible explanation for the greater FI participation in conversation with ADHD than TD is an adaptation on the part of the FI to their children's reduced verbal productivity. However, it is important to consider that the FIs differed in their reactions to the communicative difficulties of their children with ADHD. It was observed that some of the FIs during some portions of the interactions with their children sat quietly watching their children

play, without trying to communicate in any other way. Thus, there were many long pauses between communicative acts that were not measured in the current study. Another explanation could be that mothers in the Saudi culture are not used to elaborating in conversation when playing with their children. It is an anecdotal but not verified belief that mothers in Saudi may have culturally different attitudes to interacting with their children but it is not as yet supported by research. However if this were true then it would also be true of the mothers of the TD.

5.4.2.1 Use of non-verbal cues

The use of non-verbal cues (i.e., pointing and hand gestures) occurred more in FIs' interactions with their children with ADHD than with FIs' interactions with their TD children (see table 5.7 for the instances of using nonverbal cues in FIs of children with ADHD and FIs of TD children). The range of use of non-verbal cues in FIs' interactions with their children with ADHD is 6-57. However the range in FIs' interactions with TD children is 2-30. It is important to highlight that FIs of children with ADHD were using non-verbal cues combined with repetitions, commands, and questions. The possible reason for mothers to use that combination is that mothers have experienced that combination (e.g., non-verbal cues and verbal interaction) as effective in getting their children's attention and helping them to respond and continue the conversation. However, the mothers of TD children did not find it necessary to provide their children with non-verbal cues since the conversation was flowing and the children were responding appropriately. Also, it is important to mention that mothers of children with ADHD were

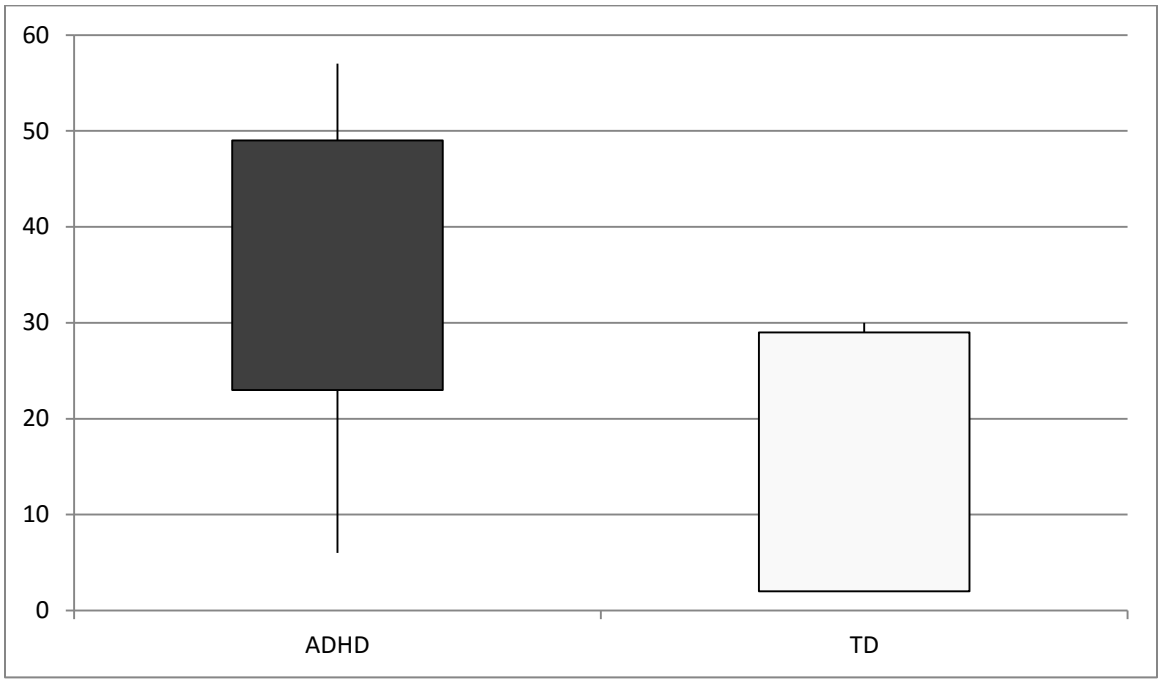
using non-verbal cues usually after at least one trial without non-verbal cues as in the sample that is presented in Figure 5.6. Added to that, it was noted in this sample that the mother was annoyed with the boy when she had to repeat herself and her loudness kept rising especially when the child started laughing.

Figure 5.6 Sample of use of non-verbal cues during interaction between the FI and the Participant with ADHD.

Transcription	Interlocutor
M؟أيش هادي الأشياء أحمد M What is this things, Ahmed?	?WH
C(يضحك) هاها C The child is laughing	
M ؟أيش هادي الأشياء M What is this things?	?WH/NV/RT
M؟ايش هادي M What is this?	?WH/NV/RT
M؟ايش هادي M What is this?	?WH/NV/RT
M؟ايش هادي M What is this?	?WH/NV/RT
M؟ايش هادي M What is this?	?WH/NV/RT
M؟ أحمد ايش هادي M Ahmed, What is the color?	?WH/RT

M: Mother; C: Child; ?WH: wh-question; RT: Repetition; NV: non-verbal cues

Figure 5.7 The number of instances of using nonverbal cues by FIs of children with ADHD and FIs of TD children during interaction with their children



5.4.2.2 Use of questions

In the present study the FIs of the children with ADHD used fewer questions than FIs of TD children. The range of use of questions by FIs during FI-ADHD interaction was 15-130 but the range of use of questions by FIs during FI-TD interaction was 46-168. There was some considerable overlap and it was necessary to look further at the type of questions used to understand where differences lay between the dyads.

When the type of question was considered, mothers of children with ADHD in the present study were found to use fewer 'when, why, and how' questions than mothers of TD children. There were only four instances of the use of those questions in all FI-ADHD interactions compared to 32 instances in FI-TD interactions. The use of 'why'

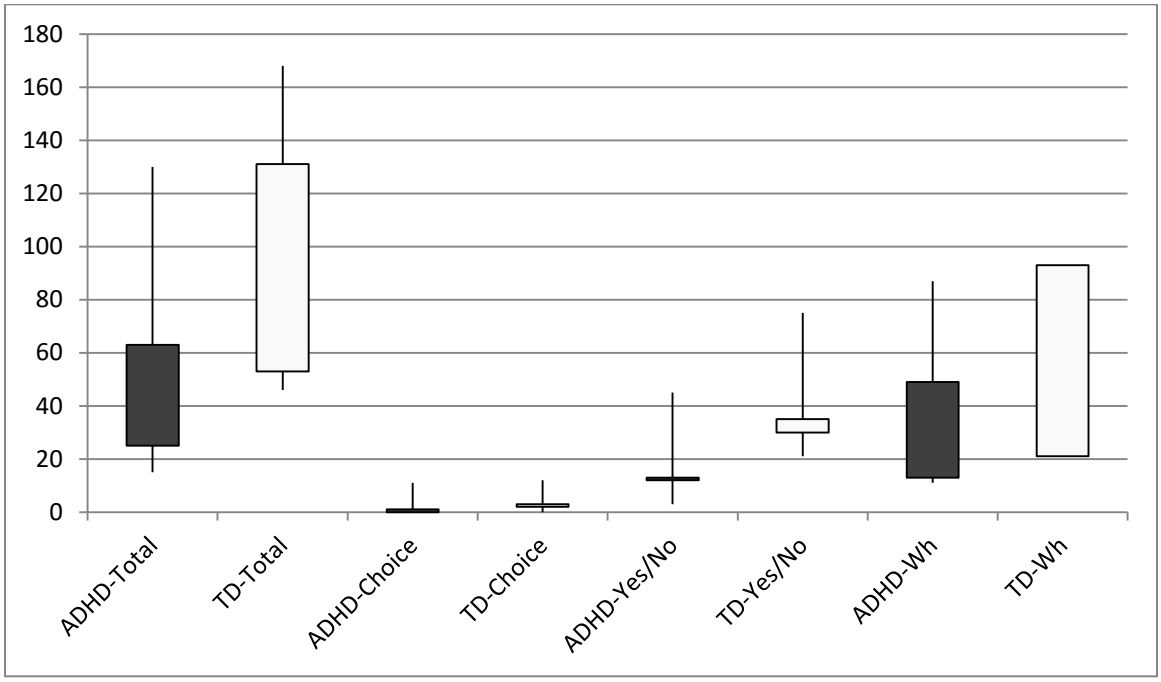
and ‘how’ questions occurred only once each in four FI-ADHD interactions but the same questions were multiple instances in all FI-TD interactions. ‘When, ‘why’, and ‘how’ are questions that demand more elaborate verbal responses and are typically used with children who have established a higher level of expressive language skills. It can be argued that FIs of children with ADHD demanded less sophisticated verbal responses from their children by asking more questions that demanded simpler responses, including requests for labeling, such as ‘what’ type of questions. According to Pepper and Weitzman (2004) the first Wh-questions that child can respond to are short and simple ones that start with ‘What’ and ‘Where’. Later the child responds to questions that start with ‘Why’ and then much later, questions that start with ‘When’ and ‘How’. The FIs of children with ADHD in the present study were indeed found to use comparatively more ‘what’ and ‘where’ questions than mothers of TD children. The FIs of children with ADHD were relying on ‘what’ questions more than the FIs of TD to maintain a simpler level of conversation and joint engagement with their children. This interpretation is further supported by the mothers’ use of ‘where’ type of questions. Another form of questions that can be responded to with unexpanded answers are closed questions that expect 'yes/no' responses.

FIs of children with ADHD in the present study relied more on using such ‘yes/no’ questions compared to FIs of TD children. This sort of question gives interlocutor a useful way of communicating with the child even before the child can use words (Pepper & Weitzman, 2004). A question such as ‘Do you want the car?’ does not even demand a verbal answer, since the child can use gesture such as pointing or nodding his head to show minimal compliance. According to Pepper and Weitzman (2004) the

interlocutor may try a yes/no questions instead of Wh-questions, when the child can not answer Wh-question.

Another explanation could be that the mothers of children with ADHD knew that the interaction was being recorded and would be used for research purposes, therefore would try to demonstrate their children's language competence by asking questions that they knew their children were capable of answering. The term "performance mode" was mentioned by Plapinger and Kretschmer (1991) to describe adults demonstrating the language capabilities of their children to the researcher. Arguably the TD dyads may experience the same motivation however.

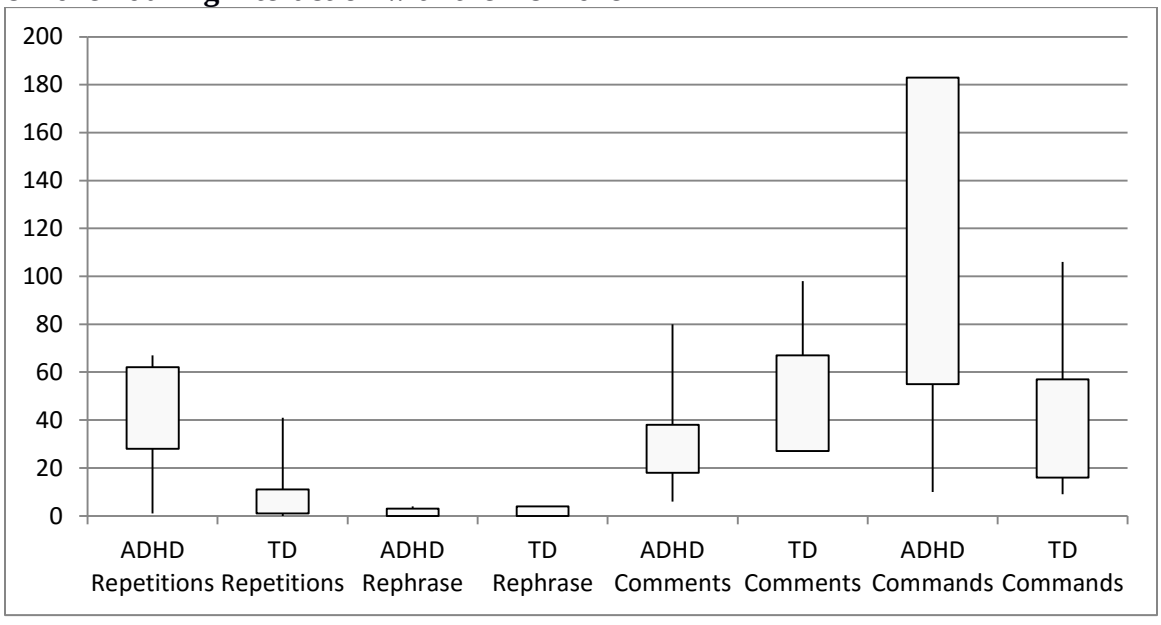
Figure 5.8 Using questions in mothers of children with ADHD and mothers of TD children during interaction with their children



5.4.2.3 Directing interaction

The aspect of response control was the main focus which includes repetition, rephrase, comments, and commands. FIs of children with ADHD are similar to the FIs of TD children in terms of not using rephrasing during their interactions with their children. The analysis revealed no rephrasing instances at all in seven FI-ADHD sessions and the instances of rephrasing in the remaining three sessions were 1, 3, and 4, respectively. The situation in the FI-TD sessions was no different from the FI-ADHD sessions since there was no rephrasing usage in seven FI-TD interactions and the instances of rephrasing in the remaining three sessions were 2, 4, and 4, respectively. The FIs of children with ADHD were found to be relying more on using repetitions during their interaction with their children compared to FIs of TD children during their interactions with their children (see figure 5.6). The mothers seemed to believe in the power of repetitions over using rephrasing to control their children's responses.

Figure 5.9 Using conversation repair by FIs' of children with ADHD and FIs' of TD children during interaction with their children



As shown in figure 5.9 the frequency of comments ranged from 6-80 in FI-ADHD sessions compared to 27-98 in FI-TD sessions. However the frequency of commands ranged from 10-183 in FI-ADHD sessions and 9-106 in FI-TD sessions. Also it is important to highlight that the instances of commands were greater than comments in all FI-ADHD interactions. In contrast the instances of comments were more numerous than commands in all FI-TD interactions (except two participants showed a pattern more like FI-ADHD samples). One explanation for this finding may be that mothers of children with ADHD used more commands than comments because they expected their children to understand commands more easily than comments, or it may be that they felt that the language they would need to use to express statements would be too advanced for their children with ADHD. This suggestion is supported by comments of Goldin-Meadow and Saltzman (2000), who found that mothers adjust their talk to their children's level of language use.

5.4.2.4 Observations on familiar interlocutor (FI) participation

In Figure 5.4 a sample of FI-ADHD interaction is presented. The FI had to keep repeating the question by calling the child's name first before the question: "Ahmed, what is this?", pointing and saying "LOOK" before asking the question "LOOK, what is this?", and repeating the question twice while using more specific words like "name" instead of "this" by saying "What is the name? What is the name?". Subsequently the FI feels that she needs to give a direct command by saying "speak" to get verbal output from her son.

In the second turn the FI repeated the same scenario of repetitions to a different question which is about "the colour of the car" and after four repetitions from the FI side the Participant with ADHD replies with one word, saying "white". So, the FI of the child with ADHD appears to believe that she needs to give more verbal stimulation to get a verbal interaction/answer from the child with ADHD. In figure 5.4 the FI participation in the conversation with the child with ADHD mainly consisted of asking questions (1, 2, 3, 4, 10, 11, 12, 13, 15, 17, 19, 20, 23, 24). However in figure 5.5 the FI participation in conversation with TD contained less questions (2, 3, 5, 20). So in the sample (Figure 5.4) there are five repetitions of the same question to get an answer from the Participant with ADHD. During this interaction with the FI, the Participant with ADHD provided fewer positive responses and the mother spent more time attempting to control, direct, and restructure her son's activity during the conversation. It was observed that the control exerted by the FI on the Participant with ADHD was in response to her son's activity level or perceived disruptive characteristics during the play session.

As a general observation from all the recordings, it is important to note that most of the FIs' responses were repetitions and/or commands attempting to get a verbal interaction or keep the child active in the conversation. The situation was totally different where the TD participants were concerned (see figure 5.5). This interaction with FI was less effortful and no repetitions were used by the FI. The TD participant's verbal interaction was more comprehensive and the answers were more detailed than the Participant with ADHD's. What is interesting is that the child has the cognitive capacity, knowing the appropriate vocabulary to answer his mother's questions so, at least at the

single word level verbal capacity was not the root of limited contributions to the interaction. It is interesting to note the use of the inclusive 'we' pronoun by the TD child, as he discusses joint activity in a way that shows reciprocal interest and alignment with the conversational partner.

When the Participant with ADHD was interacting with the FI we can see the FI was doing most of the talking, taking over or directing most of the conversation, using repetitions and direct commands to get verbal interaction. The FI of the Participant with ADHD did not depend on comments, interpretations or expansions unlike the TD participant's mother. During the interaction between the mothers (FI) and participants with ADHD I observed two patterns from mothers; either sitting quietly and watching the child or being directive in terms of asking a lot of questions. Both patterns may have affected the communication samples. When the FIs were sitting quietly, they were watching their children play, without trying to communicate in any other way. These FIs may have expected less verbal interaction out of their children and therefore did not invite or initiate communicative acts. One possible explanation is that FIs differ in their reaction to the communication difficulties expressed by children with ADHD. Thus, there were many long pauses between communicative acts that although were not measured in the present study, resulted in a decrease in the verbal interaction for both children with ADHD and their mothers.

Regarding the second observed pattern of interaction between the FIs and participants with ADHD, namely FIs being more directive, these mothers tended to compensate for what their children missed due to ADHD related difficulties by directing

more communication to their children. They may have sensed the inadequacy of their child's linguistic communication and this may have resulted in FIs trying to teach rather than support language development. One possible explanation is that the FI's dominance may reflect the FI's extra effort to establish more attention from the child rather than assuming a directive role on purpose. It is suggested that whether the FI's reaction is in the form of reduced verbal interaction or flooding their children with ADHD with questions and commands, either way the intervention represented by the parent training has a role to play in remediation for these patterns of interaction.

The Hanen parent training program "It Takes Two to Talk", stated that to be involved in enjoyable interaction is crucial for communicating or learning how to communicate (Pepper & Weitzman, 2004). From my clinical experience waiting is a powerful tool and can often make children aware that a response is expected. Children may get used to their mothers doing most of the talking but when mothers change their pattern, stay quiet and wait for the child to start the interaction or continue a conversation that has already started, they may be surprised at how much more the child will communicate. But it is important to clarify that waiting is not long pauses without talking, as much as it is giving the child a chance to talk and showing with your face (as interlocutor) that you are expecting an interaction from the child. We have to consider as clinicians however, whether children with ADHD need a subtly adapted approach, as their inability to focus on interaction, rather than what they already focus on may render them less able to pick up on pausing and other prompts. It may be that physical and visual methods of engaging their attention are required.

5.5 Conclusion

The present study utilized a qualitative approach in addition to some quantitative analysis that was also carried out in order to gain a comprehensive view of the verbal pragmatic characteristics of 4-5 year old Saudi boys with ADHD in comparison to age-matched typically developing children. The findings showed that verbal skills are more challenging for children with ADHD relative to their unaffected peers. The evidence for this came from a higher incidence of "no verbal response" than TD participants and use of more single word productions during their interactions with FI. However the incidence of "mazes" did not differentiate the children with ADHD from TD children. The mothers of children with ADHD were using more questions and directives, fewer comments, and they had a greater tendency to use non-verbal cues while interacting with their children.

CHAPTER SIX
CONCLUDING COMMENTS

The chapter starts with a critical discussion in section 6.1; that is followed by the clinical implications of both the quantitative and the qualitative investigations in section 6.2, and suggestions for future directions in research in section 6.3. A discussion of the limitations of the study is given in section 6.4. Finally, section 6.5 presents the conclusion.

6.1 Critical discussion of the two studies

The research questions that motivated this thesis asked if there were differences in verbal pragmatic skills between children with a diagnosis of ADHD and their typically developing peers that were matched in age and gender. The unique contribution of this thesis is that it provides evidence of verbal differences between children with ADHD and TD children, especially in the reduced amount of verbal output in participants with ADHD compared to TD participants. The finding of reduced verbal output contradicts the DSM-IV-TR and ICD10 diagnostic criteria for ADHD. In the current study the reduced amount of verbal output, further analyzed as the consequence of, the failure to give appropriate feedback to the interlocutor, inappropriate responses to requests or questions by the interlocutor, and shorter turns produced by the children with ADHD arguably verify the inattentive and impulsive behavioural characteristics of children with ADHD.

This was a preliminary study, which highlighted the verbal pragmatic skills of Saudi children with ADHD using quantitative statistical analysis in study one. A more

detailed quantitative and qualitative approach was undertaken in study two, in order to elucidate the possible causes of significant differences found in the first study. Study two employed discourse analysis in order to describe more closely the occurrence of targeted communication features of the interaction. These interactional behaviours (of adult and child) provide evidence to account for the children with ADHD's impoverished verbal output when compared to the TD. The combination between those approaches to investigate the verbal pragmatic skills can be considered ideal for comparing children with ADHD and TD children. Also, this will ensure that our understanding of the differences between the children with ADHD and TD children is enhanced by integrating two different approaches to investigating the same phenomenon.

We can conclude based on the findings of the two current studies that the core behavioural characteristics of ADHD (i.e., inattention, impulsivity, and hyperactivity) may contribute to the oral pragmatic difficulties of children with ADHD. The validity of the results and conclusions of the current study can probably be generalized. There seems no reason to believe that differences between Saudi-Arabian children with ADHD and Saudi-Arabian TD children should be unique. However, the findings will be made more robust if similar studies are undertaken in other languages, dialects and cultures (e.g., British, Egyptian, Russian), as well as of female participants. As has been pointed out, all the previous empirical studies of this topic are relatively old. The research community needs to revisit the hypothesis of excessive talk in children with ADHD.

Another major contribution of the current study will be to develop a database that contains an audio-visual language sample data-set for Saudi Arabian Arabic speaking

children. It is intended that the audio-visual data set will be available via Queen Margaret University (QMU) after getting necessary approval from the primary researcher.

Finally, the findings and conclusions of the current study emphasize the importance of providing those working with this client group with proper strategies that would assist them in understanding the verbal pragmatic skills in the children with ADHD. These would enhance the development of children with ADHD in communicative skills generally and verbal pragmatic skills specifically via direct intervention activating the child-centred approach or employing the family-centred approach, by providing the parents with parent training and appropriate strategies that support families in promoting their child's optimal communicative skills development. The findings from analysis of interactions with children with ADHD reflects those from other young children with communication disabilities in that the interactions of both the child and the adult may need to be addressed in order to maximise language learning and socialisation.

6.2 Clinical implications of the two studies

The children with ADHD in the current study showed evidence of weak communicative skills compared to the typically developing age-matched children. The findings suggested that the core behavioural characteristics of ADHD (i.e., inattention, impulsivity, and hyperactivity) are negatively affecting their verbal pragmatic skills compared to TD peers, as represented by reduced verbal productivity, shorter turns, more

difficulty with topic maintenance, and less complexity of responses. Very careful attention is needed in assessing children with ADHD to determine the nature and the extent of their language use difficulties. The results of the current study highlight the areas of deficit in the verbal and verbal pragmatic skills of children with ADHD. All targeted behaviours in the current study (e.g. verbal productivity in terms of extending topic through responses and appropriate spontaneous contributions) could be included as main areas in pragmatic intervention programs for ADHD. The existence of a relationship between pragmatic competency and ADHD has been proposed in previous studies (Ketelaars, et al., 2010). Difficulties with appropriate use of language, exhibited by children with ADHD, can be associated with their lack of social competence, which will be reflected in their conversational skills. The lack of attention to details and interest in extended discussion on a topic may also be due to underdeveloped linguistic complexity. Cohen et al. (1998) reported that language difficulties experienced by children with ADHD might also lead to social difficulties. Including conversational skills as a main element in the intervention program for children with ADHD will have a great impact on the level of progress that may be achieved. Intervention strategies for enhancing appropriate conversational exchanges and eliminating inappropriate pragmatic behaviours in the children with ADHD should focus on verbal productivity, turn-taking, initiating a topic, topic maintenance, ending conversation, enhancing the complexity of responses and responding to conversation partners. There are also examples of interventions where the family is involved and conversational partners such as parents and peers are trained to optimize their interactions to enable the child with ADHD to participate fully. Several current language-based interventions may also be of benefit to

children with ADHD where the ability to develop extended language, especially as oracy is known to underlie educational attainment and literacy (Pepper and Weitzman, 2004). ASHA (1996) claimed that children with ADHD are different from each other in clinical manifestations, cognitive profiles, aetiologies, responses to treatment and prognosis. Because of the multidimensional nature of attention disorders, no one intervention approach will be sufficient. It is recommended that the speech-language pathologist and other professionals employ multiple methods from several sources.

The results presented in the current study underline the importance of a systematic routine screening of communication skills by a speech-language pathologist to be performed as a part of the assessment procedures in children referred to ADHD assessment. The pervasive role language skills play in regulating children's behaviours emphasizes the need for speech-language pathologist to act as an effective member in a multidisciplinary assessment team for ADHD. At present no such standard procedure exists in Saudi Arabia. The area of speech and language is generally not assessed; however it depends on the interest of each individual professional. The lack of easily administrable assessment tools for Arabic may have contributed to this situation. We suggest that the Saudi Arabian adaptation of standardized tests is needed in order to help in assessing Saudi children's language and communication abilities. However assessments with appropriate stylistic and content analysis such as Peter and the Cat (Black Sheep Press) which could be translated and adapted to Saudi culture could be valuable in tracking progress from interventions. The needs can also be prioritized through careful dynamic assessment throughout any intervention (Peña et al., 2014).

Regarding the mothers, in the current research study it was observed that mothers

during the FI-ADHD interaction used questions more frequently than statements and descriptions. Also, it was observed that mothers used more directives (i.e., commands) which probably indicate the mothers' tendency to use controlling and directive interactions with their children with ADHD. MacDonald and Carrol (1992) and more recently Pepper and Weitzman (2004) suggested that the use of comments should be valued over questions and commands, since comments allow the conversation to continue back and forth while questions can limit the child's responses and end the conversation. This is especially the case with closed questions (e.g., yes/no questions). They further suggested that one way for an interlocutor to interact with a child is to match the child's level of communication. This can be achieved by using simpler sentences rather than complicated sentences. By doing this the mother or other adult bridges the gap from the child's level of communication to the age appropriate performance level that is expected from that age group. It is also essential to emphasize the importance of parent training by providing mothers with strategies that would assist them to enhance the development of their children's communication and more specifically their verbal pragmatic skills. Jones et al. (2007) concluded that parent training programs are considered to be a viable first line intervention for the preschool children with ADHD. The literature mentioned parent-professional partnerships in approaching intervention with children (Pepper and Weitzman, 2004). This partnership views the parent as an expert in relation to their child and views the speech-language pathologist as a consultant that provides the parent with proper advice regarding the child's disorder which was suggested by Weitzman and Greenberg (2002).

One of the major implications of the study is the need to create a mother-child

verbal interaction checklist. The researcher is intending to use the results of the current study as the first step in creating a checklist that can be used clinically to assess mother-child interaction at the verbal level. Speech-language pathologists and other professionals may use this checklist as a guide in their intervention plans as to what skill is expected to improve as a result of using a specific interaction strategy. The checklist will be piloted on typically developing children. The mothers of these children will be encouraged to comment about the checklist and suggest further items. Future research will include developing norms for the checklist, as the first of its kind in region. Also, the plan is to include other Arab countries beside Saudi Arabia.

6.3 Suggested future research

This is the first known study that investigates the verbal pragmatic characteristics in Arabic speaking children with ADHD. The research has analysed the relationship between ADHD and verbal language use difficulties in Arabic speaking children. The findings of the current study contradict some previous studies and are consistent with others but they add to the existing literature regarding ADHD verbal pragmatic competency. Further studies using this theoretical framework for studying language skills generally and verbal and non-verbal pragmatic skills specifically in the ADHD population would certainly be valuable not just for speech-language pathologists, but also for other professionals, such as psychologists, psychiatrists, teachers, applied behavioural analysts and educators. Further research is needed to extend our knowledge of verbal pragmatic characteristics in children with ADHD, for example, controlling for intellectual

ability and subtypes of ADHD and using larger numbers of participants, also severity of the symptoms should be considered.

The results of the current study suggest the necessity of assessing expository discourse in addition to the other aspects of language assessment with the purpose of identifying weaknesses at the level of verbal and nonverbal pragmatics. Expository discourse is discourse that explains or describes a topic. According to Nippold et al. (2008) expository discourse is the use of language to convey information and it is important for examining natural language production in children which consists of a monologue providing factual descriptions or explanations of events (i.e., explanations of the rules of a game or procedural descriptions). Expository discourse is often required in educational, social, and vocational contexts that may help to explain why expository tasks are generally more effective than conversational or narrative tasks in eliciting complex syntax in typically developing children. The early detection of language weaknesses in expository discourse may help guide our intervention practices to ensure children possess the required language skills to participate in social interactions with interlocutor (Nippold et al., 2005).

Factors that may contribute to the language and verbal pragmatic deficits of children with ADHD need to be identified. The demand comes from the great need for a better understanding that will be translated positively to more effective clinical practice, at the level of assessment and intervention. The methodological approach adopted in this study, using audio visual recording for the children interacting with UI and FI to collect a language sample proved to be effective. So the researcher would recommend using the same approach in future quantitative or qualitative studies. One of the main strengths in

the current study is developing an audio-visual data set for Saudi Arabian Arabic speaking children. Below, are outlined specific suggestions for future research work using the present data corpus as well as extending to new protocols.

It will be possible to use the same set of data for the purpose of studying the other aspects of language functioning (i.e., syntax and vocabulary). This would be useful clinically because of the overlap among pragmatic skills, language structure, and narrative discourse. Further research is needed to differentiate between those children who have ADHD plus language impairment, and those who appear to have ADHD only.

It would also be useful to use the same methodological procedures as those used in this study in order to investigate the verbal pragmatic skills in children with ADHD when their attentional state was altered with stimulant medication. The consideration of the results in the light of theories about the role of executive function in contributing to the behaviours seen in children with ADHD would be of interest. Since language is a behaviour that requires a high level of organization, the association between executive function and language use would be a useful issue to explore in further investigations.

Future research studies should include other age ranges, especially to see if our results would be replicated with older children. Finally, future research should duplicate the current study to discover if similar results are achieved.

6.4 Limitations

Apart from the limitation of this study to the nature of verbal pragmatic language skills in ADHD Arabic speaking boys specifically for the age range of 4 to 5 years in the Jeddah Region of Saudi Arabia, there are methodological limitations that must be

mentioned. One major limitation of the study is the small sample included in the study. Data for ten children with ADHD and ten typically developing may not be abundant enough to provide powerful representative statistical analysis. There is a lack of studies that provide solid information about the development of pragmatics in typically developing Arabic speaking children, and a lack of studies that target the language skills in the ADHD population in Arabic speaking children. It would be useful to investigate the possible influence of interlocutor on the verbal productivity of children with ADHD, using a larger sample.

The current study did not take measures of vocabulary and syntax in the participants with ADHD or control for them as inclusion criteria. However, it is important to emphasize that there are no available norms in Saudi Arabia. The time and resources of the current study did not permit the recruitment and involvement of further groups of children (e.g., ADHD without language impairment, language impairment alone), although such information may have been advantageous. Another limitation was related to ADHD subtypes: predominantly inattentive type, predominantly hyperactive and impulsive type, and combined type which were not considered in the current research study.

The possibility that the findings in the current research study might have been influenced by the setting and whether these findings can be generalized to other contexts should be considered. A more naturalistic setting, where FI- child interaction was audio visually recorded at home may have been preferable and more representative of every day interaction. This would not however have allowed comparison with UI interaction. One possibility for future research would be collecting data such as questionnaires and

personal interviews which may be more culturally appropriate than asking mothers to be videotaped in their homes. Using the same setting arrangements as in the current study, would have the advantage of replication and thus could be used for comparison purposes.

Despite the limitations of the current research, strengths lie in the detailed analysis and coding of verbal pragmatic behaviours for children with ADHD and their age and gender matched typically developing peers interacting with two interlocutors. Insights into the pattern of FI- child and UI- child interactions of ADHD and TD can only be achieved with accurate and detailed coding, which the study provided. Although few other studies addressed FI and UI interactions with children with ADHD, this study was novel in that it addressed a new population in a culture that was not studied by any similar research.

Further research is urgently needed to enrich our knowledge of the pragmatic characteristics of Arabic speaking children with ADHD by employing a larger number of participants. A more naturalistic setting and context, and subtypes of ADHD in addition to more qualitative analysis should be included in future studies.

6.5 Conclusion

The present thesis utilized two methodological approaches (quantitative and qualitative) to give a comprehensive view of the verbal pragmatic characteristics of 4-5 year Saudi boys with ADHD in comparison to matched typically developing children. This study provided a clear demonstration that the verbal pragmatic skills exhibited by children with ADHD were different to their matched TD peers at the level of reduced

verbal productivity, shorter turns, more difficulty with topic maintenance, and less complex verbal responses compared to typically developing children. However, no effect was demonstrated for interlocutor familiarity in ADHD or TD participants. Also, the findings showed that mothers of children with ADHD were using more questions and directives and fewer comments while interacting with their children. A number of implications are drawn from the research with the promise that the present study's findings of mother's conversational repair and interaction style can influence the selection of intervention goals and shape the nature of their role and involvement in the intervention process.

REFERENCES

ACCARDO, P. J. and WHITMAN, B.Y., 2002. *Dictionary of developmental disabilities terminology*. Maryland: Paul H. Brooks Publishing.

ADAMS, C., 2002. Practitioner Review: The assessment of language pragmatics. *Journal of Child Psychology and Psychiatry.* November, vol. 43, no. 8, pp. 973-987.

ADAMS, C. and LLOYD, J., 2005. Elicited and spontaneous communicative functions and stability of conversational measures with children who have pragmatic language impairments. *International Journal of Language & Communication Disorders.* July-September, vol. 40, no. 3, pp. 333-347.

ADAMS, C., COOKE, R., CRUTCHLEY, A., HESKETH, A. and REEVES, D., 2001. *Assessment of comprehension and expression 6-11 (AGE 6-11).* Windsor: NFER-Nelson.

AL-HAIDAR, F. A., 2003. Co-morbidity and treatment of attention deficit hyperactivity disorder in Saudi Arabia. *East Mediterranean Health Journal.* April, vol. 9, pp. 988-995.

ALQAHTANI, M., 2010a. Attention-deficit hyperactive disorder in school-aged children in Saudi Arabia. *European Journal of Pediatrics.* March, vol. 169, pp. 1113-1117.

ALQAHTANI, M., 2010b. The comorbidity of ADHD in the general population of Saudi Arabian school-aged children. *Journal of Attention Disorders.* July, vol. 14, no.1, pp. 25-30.

AL-YAMI, A. A., 1993. *A comparative study between typically developing children & children with ADHD.* Master's thesis ed. University of Aum Al-Qura.

AMERICAN ACADEMY OF PEDIATRICS, SUBCOMMITTEE ON ATTENTION-DEFICIT/HYPERACTIVITY DISORDER, STEERING COMMITTEE ON QUALITY IMPROVEMENT, AND MANAGEMENT, 2011. ADHD: Clinical practice guideline for the diagnosis, evaluation, and treatment of attention-deficit/hyperactivity disorder in children and adolescents. *Pediatrics*. November, vol. 128, no.5, pp. 1007–1022.

AMERICAN ACADEMY OF PEDIATRICS, 2000. Clinical practice guidelines: Diagnosis and evaluation of a child with attention-deficit/hyperactivity disorder. *Pediatrics.* May, vol. 105, no. 5, pp. 1158-1170.

AMERICAN PSYCHIATRIC ASSOCIATION, 2013. *Diagnostic and statistical manual of mental disorders (DSM-5).* 5th ed. Washington, DC: APA.

AMERICAN PSYCHIATRIC ASSOCIATION, DSM-5 DEVELOPMENT, 2012. Attention Deficit/Hyperactivity Disorder [online]. [Viewed 14 December 2012]. Available from http://www.dsm5.org/ProposedRevisions/Pages/proposedrevision

AMERICAN PSYCHIATRIC ASSOCIATION, 2000. *Diagnostic and statistical manual of mental disorders-IV-TR* (revised). Washington, DC: APA.

AMERICAN PSYCHIATRIC ASSOCIATION, 1994. *Diagnostic and statistical manual of mental disorders.* 4th ed. Washington, DC: APA.

AMERICAN SPEECH-LANGUAGE-HEARING ASSOCIATION, 2008. *2008 School survey report: Caseload characteristics.* Rockville, MD: Author.

AMERICAN SPEECH-LANGUAGE-HEARING ASSOCIATION, 1997. Roles of audiologists and speech-language pathologists working with persons with attention deficit hyperactivity disorder. *Journal of Speech and Hearing Research*. March, vol. 39, no. 17, pp. 273-300.

AMERICAN SPEECH-LANGUAGE-HEARING ASSOCIATION, 1993. *Definitions of communication disorders and variations*. [Viewed 21 July 2007]. Available from: http://www.asha.org/policy.

ANDERSON, C. A., HINSHAW, S. P. and SIMMEL, C., 1994. Mother-child interactions in ADHD and comparison boys: Relationships with overt and covert externalizing behaviours. *Journal of Abnormal Child Psychology.* March, vol. 22, no. 2, pp. 247-265.

ANDREOU, G., AGAPITOU, P. and KARAPETSAS, A., 2005. Verbal skills in children with ADHD. *European Journal of Special Needs Education.* April, vol. 20, no. 2, pp. 231-238.

ASHERSON, P., BROOKES, K., FRANKE, B., CHEN, W., GILL, M. and EBSTEIN, R. P., 2007. Confirmation that a specific haplotype of the dopamine transporter gene is associated with combined-type ADHD. *American Journal of Psychiatry*. April, vol. 164, no. 4, pp. 674-677.

BAKER, L. and CANTWELL, D. P., 1992. Attention deficit disorder and speech/language disorders. *Comprehensive Mental Health Care*. January, vol. 2, no. 1, pp. 3-16.

BARKLEY, R. A., 2010. *Attention deficit hyperactivity disorder in adults: The latest assessment and treatment strategies.* Massachusetts: Jones and Bartlett Publishers.

BARKLEY, R. A., 2006. *Attention deficit hyperactivity disorder: A handbook for diagnosis and treatment.* 3rd ed. New York: The Guilford Press.

BARKLEY, R. A., 2000. *Taking charge of ADHD: The complete authoritative guide for parents*. New York: The Guilford Press.

BARKLEY, R. A. and MURPHY, K. R., 2006. *Attention deficit hyperactivity disorder: A clinical workbook.* 3rd ed. New York: The Guilford Press.

BARKLEY, R., CUNNINGHAM, C. and KARLSSON, J., 1983. The speech of hyperactive children and their mothers: comparison with normal children and stimulant drug effects. *Journal of Learning Disabilities*. February, vol. 16, no. 2, pp. 105-110.

BARKLEY, R. A., DUPAUL, G. J. and MCMURRAY, M. B., 1990. A Comprehensive evaluation of attention deficit disorder with and without hyperactivity as defined by research criteria. *Journal of Abnormal Child Psychology.* December, vol. 58, no. 6, pp. 775-789.

BARKLEY, R. A., FISCHER, M., EDELBROCK, C. S. and SMALLISH, L., 1990. The adolescent outcome of hyperactivity children diagnosed by research criteria: An 8-year prospective follow up study. *Journal of the American Academy of Child and Adolescent Psychiatry.* July, vol. 29, no. 4, pp. 546-557.

BARKLEY, R. A., KARLSSON, J., POLLARD, S. and MURPHY J. V., 1985. Developmental changes in the mother-child interactions of hyperactive boys: Effects of two dose levels of ritalin. *Journal of Child Psychology and Psychiatry.* September, vol. 26, no. 5, pp. 705-715.

BEDROSIAN, J. L., 1993. Making minds meet: Assessment of conversational topic in adults with mild to moderate mental retardation. *Topics in Language Disorders.* May, vol. 13, no. 3, pp. 36-46.

BEDROSIAN, J. L., WANSKA, S. K., SYKES, K. M., SMITH, A. J. and DALTON, B. M., 1988. Conversational turn-taking violations in mother-child interaction. *Journal of Speech and Hearing Research.* March, vol. 31, no. 1, pp. 81-86.

BEFERA, M. and BARKLEY, R. A., 1984. Hyperactive and normal girls and boys: Mother-child interactions, parent psychiatric status and child psychopathology. *Journal of Child Psychology and Psychiatry.* May, vol. 26, no. 3, pp. 439-452.

BEITCHMAN, J. H., HOOD, J. and INGLIS, A., 1990. Psychiatric risk in children with speech and language disorders. *Journal of Abnormal Child Psychology.* June, vol. 18, no. 3, pp. 283–296.

BEITCHMAN, J. H., HOOD, J., ROCHON, J. and PETERSON, M., 1989. Empirical classification of speech/language impairment in children: II. Behavioural characteristics. *Journal of the American Academy of Child and Adolescent Psychiatry*. January, vol. 28, no.1, pp. 118–123.

BERNSTEIN, D. K. and TIEGERMAN-FARBER, E., 2002. *Language and communication disorders in children.* 5th ed. Boston: Allyn & Bacon.

BIGNELL, S. and CAIN, K., 2007. Pragmatic aspects of communication and language comprehension in groups of children differentiated by teacher ratings of hyperactivity and inattention. *British Journal of Developmental Psychology*. November, vol. 25, no.4, pp. 499–512.

BISHOP, D. V. M., 2004. *Uncommon understanding: Development and disorders of language comprehension in children*. New York: Psychology Press.

BISHOP, D. V. M., 2003.*The Children's Communication Checklist (CCC-2).* 2nd ed. Hove: Psychological Cooperation.

Bishop, D. V. M.,1998. Development of the children's communication checklist (CCC): A method for assessing qualitative aspects of communicative impairment in children. *Journal of Child Psychology & Psychiatry*. September, vol. 39, no. 6, pp. 879-891.

BISHOP, D. V. M. and BAIRD, G., 2001. Parent and teacher report of pragmatic aspects of communication: Use of the children's communication checklist in clinical setting. *Developmental Medicine and Child Neurology*. December, vol. 43, no. 12, pp. 809-818.

BISHOP, D. V. M. and LEONARD, L. B., 2000. *Speech and language impairments in children: Causes, characteristics, intervention and outcome*. Hove: Psychology Press.

BLOOM, L. and LAHEY, M., 1978. *Language development and language disorders.* New York: Wiley.

BOOTH, J. N., TOMPOROWSKI, P. D., BOYLE, J. M., NESS, A. R., JOINSON, C., LEARY, S. D. and REILLY, J. J., 2013. Associations between executive attention and objectively measured physical activity in adolescence: Findings from ALSPAC, a UK cohort. *Mental Health and Physical Activity*. October, vol. 6, no. 3, pp. 212-219.

BORNSTEIN, M. H., HAYNES, M. O., PAINTER, K. M. and GENEVRO, J. L., 2000. Child language with mother and with stranger at home and in the laboratory: A methodological study. *Journal of Child Language*. June, vol. 27, no. 2, pp. 407–420.

BRINTON, B. and FUJIKI, M., 1984. Development of topic manipulation skills in discourse. *Journal of Speech and Hearing Research*. September, vol. 27, no. 3, pp. 350-358.

BRINTON, B., FUJIKI, M. and POWELL, J., 1997. The ability of children with language impairment to manipulate topic in a structured task. *Language, Speech, and Hearing Services in Schools*. January, vol. 28, no. 1, pp. 3-11.

BROWN, T. E., 2009. *ADHD comorbidities: Handbook for ADHD complications in children and adults*. Washington, DC: American Psychiatric Publishing.

BROWN, P. M. and REMINE, M. D., 2004. Building pretend play skills in toddlers with and without hearing loss: Maternal scaffolding styles. *Deafness and Education International*. October, vol. 6, no. 3, pp.151-175.

BRUCE, B., THERNLUND, G. and NETTELBLADT, U., 2006. ADHD and language impairment: A study of parent questionnaire FTF (five to fifteen). *European Child & Adolescent Psychiatry*. February, vol. 15, no.1, pp. 52-60.

CAMARATA, S.M. and GIBSON, T., 1999. Pragmatic language deficits in attention deficit hyperactivity disorder (ADHD). *Mental Retardation and Developmental Disabilities*. August, vol. 5, no. 3, pp. 207-214.

CAMARATA, S. M. and YODER, P., 2002. Language transactions during development and intervention: theoretical implications for development neuroscience. *International Journal of Developmental Neuroscience*. June-August, vol. 20, no. 3, pp. 459-465.

CANTWELL, D. P. and BAKER, L., 1991. *Psychiatric and developmental disorders in children with communication disorder*. Washington, DC: American Psychiatric Press.

CANTWELL, D. P. and BAKER, L., 1987. *Developmental speech and language disorders*. New York: The Guilford Press.

CANTWELL, D. P. and BAKER, L., 1985. Psychiatric and learning disorders in children with speech and language disorders: A descriptive analysis. In: K. D. GADOW, ed. *Advances in learning and behavioural disabilities* (Vol. 4). Greenwich, CT: JAL, pp. 29-47.

CANTWELL, D. P., BAKER, L. and MATTISON, R., 1981. Prevalence, type and correlates of psychiatric diagnosis in 200 children with communication disorder. *Developmental and Behavioural Pediatrics*. December, vol. 2, no. 4, pp.131–136.

CANTWELL, D. P., BAKER, L. and MATTISON, R. E., 1979. The prevalence of psychiatric disorder in children with speech and language disorder: An epidemiological

study. *Journal of the American Academy of Child Psychiatry*. Summer, vol.18, no. 3, pp. 450–459.

CARLSON, C. L., TAMM, L. and GAUB, M., 1997. Gender differences in children with ADHD, ODD, and co-occuring ADHD/ODD identified in school population. *Journal of the American Academy of Child and Adolescent Psychiatry*. December, vol. 36, no. 12, pp. 1706-1714.

CATTELL, R., 2000. *Children's language: Consensus and controversy*. London: Cassell.

CAULFIELD, R. A., 2001. *Infants and toddlers.* New Jersey: Prentice-Hall, Inc.

CENTERS FOR DISEASE CONTROL AND PREVENTION, 2010. Attention-deficit/hyperactivity disorder (ADHD): Data and statistics. Retrieved from www.cdc.gov/NCBDDD/adhd/data.html.

CENTERS FOR DISEASE CONTROL AND PREVENTION, 2005. Prevalence of diagnosis and medication treatment for attention-deficit/hyperactivity disorder-United States, 2003. *Morbidity and Mortality weekly Report*. September, vol. 54, no. 34, pp. 842-847.

COHEN, M. W., 1998. *The attention zone: A parents' guide to attention deficit /hyperactivity disorder.* Washington, DC: Brunner/Mazel.

COHEN, N. J., 2005. The impact of language development on the psychological and emotional development of young children. In: R. E. TREMBLAY, R. G. BARR and R. D. PETERS, ed. *Encyclopedia on Early Childhood Development* [online]. Montreal, Quebec: Centre of Excellence of Early Childhood Development; 2005:1-7. Available at: http://www.excellence-earlychildhood.ca/documents/CohenANGxp.pdf. Accessed [14 Feb 2006].

COHEN, N. J., VALLANCE, D. D., BARWICK, M. and IM, N., 2000.The interface between ADHD and language impairment: An examination of language, achievement, and cognitive processing. *Journal of Child Psychology and Psychiatry and Allied Disciplines*. March, vol. 41, no. 3, pp. 353-362.

COHEN, N. J., MELANIE, A. B., NAOMI, B. H., VALLANCE, D. D. and NANCIE, I., 1998. Language, achievement, and cognitive processing, in psychiatrically disturbed children with previously identified and unsuspected language impairments. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*. September, vol. 39, no. 6, pp. 853-864.

CONNOR, D. F., 2002. Preschool attention deficit hyperactivity disorder: A review of prevalence, diagnosis, neurobiology, and stimulant treatment. *Developmental and Behavioural Pediatrics*. February, vol. 23, no.1, pp. S1-S9.

CONNOR, D. F., EDWARDS, G., FLETCHER, K. E., BAIRD, J., BARKELY, R. A. and STEINGARD, R. J., 2003. Correlates of comorbid psychopathology in children with ADHD. *Journal of the American Academy of Child and Adolescent Psychiatry*. February, vol. 42, no. 2, pp.193-200.

CONTI-RAMSDEN, G., 1994. Language interaction with atypical language learners. In: C. GALLAWAY and B. J. RICHARDS, ed. *Input and Interaction in Language Acquisition*. Cambridge University Press, pp. 183-195.

CONTI-RAMSDEN, G. and PEREZ PEREIRA, M.,1999. Conversational interactions between mothers and their infants who are congenitally blind, have low vision, or are sighted. *Journal of Visual Impairment and Blindness*. January, vol. 93, no. 11, pp. 691-703.

COOPER, P. and O'REGAN, F. J., 2001. *Educating children with AD/HD: A teacher's manual.* New York: Routledge Falmer.

COPELAND, A. P., 1979. Types of private speech produced by hyperactive and nonhyperactive boys. *Journal of Abnormal Child Psychology*. June, vol. 7, no. 2, pp. 169-177.

COSTELLO, E. J., EGGER, H. L. and ANGOLD, A., 2005. The developmental epidemiology of anxiety disorders: Phenomenology, prevalence, and comorbidity. *Child and Adolescent Psychiatric Clinics of North America.* October, vol. 14, no. 4, pp. 631-648.

CRAIG, H. K. and EVANS, J. L., 1993. Pragmatics and SLI: Within-group variations in discourse behaviours. *Journal of Speech and Hearing Research*. August, 36, no. 4, pp. 866-878.

CRAIG, H. K. and EVANS, J. L., 1991. Turn exchange behaviours of children with normally developing language: The influence of gender. *Journal of Speech and Hearing Research*. August, vol. 34, no. 4, pp. 777-789.

CRAIG, H. K. and EVANS, J. L., 1989. Turn exchange characteristics of SLI children's simultaneous and nonsimultaneous speech. *Journal of Speech and Hearing Research*. August, vol. 54, no.4, pp. 334-347.

CUNNINGHAM, C. E., 2007. A family-centred approach to planning and measuring the outcome of interventions for children with attention-deficit/hyperactivity disorder. *Journal of Paediatric Psychology*. January-February, vol. 7, no. 1, pp. 60-72.

CUNNINGHAM, C. E. and BARKLEY, R. A., 1979. The interactions of normal and hyperactive children with their mothers in free play. *Child Development*. March, vol. 50, no. 1, pp. 217-224.

CUTTING, J., 2008. *Pragmatics and discourse: A resource book for students.* London: Routledge.

DAPARMA, A., GEFFNER, D. and MARTIN, N., 2011. Prevalence and nature of language impairment in children with attention deficit/hyperactivity disorder. *Contemporary Issues in Communication Science and Disorders.* Fall, vol. 38, no.4, pp. 119-125.

DENDY, C. A. Z., 2000. *Teaching teens with ADD and ADHD: A quick reference guide for teachers and parents*. Clark Hill: Woodbine House.

DURSTON, S., DAVIDSON, M. C., MULDER, M. J., SPICER, J. A., GALVAN, A., TOTTENHAM, N., SCHERES, A., CASTELLANOS, F. X., VAN ENGELAND, H. and CASEY, B. J., 2007. Neural and behavioural correlates of expectancy violations in attention-deficit hyperactivity disorder. *Journal of Child Psychology and Psychiatry*. Fall, vol. 48, no. 9, pp. 881–889.

DYKMAN, R. A., 2005. Historical aspects of attention deficit hyperactivity disorder. In D. GOZAL and D. L. MOLFESE, eds. *Attention deficit hyperactivity disorder: From genes to parents.* Totowa, NJ: Humana Press, pp.1-40.

EL-HALEES, Y. and WIIG, E. H., 1999. *Arabic language screening tests - Preschool and school-age.* Amman, Jordan: University of Jordan & Arlington, TX: Schema Press.

ERVIN-TRIPP, S., 2000. Studying conversation: How to get natural peer interaction. In: L. MENN and N.B. RATNER, eds. *Methods for studying language production*. Mahwah, NJ: Lawrence Erlbaum, pp. 224-255.

ERVIN-TRIPP, S., 1979. Children's verbal turn taking. In: E. OCHS and B. SCHIEFFELIN, ed. *Developmental pragmatics*. New York: Academic Press, pp. 391-414.

EVANS, J. L. and CRAIG, H. K., 1992. Language sample collection and analysis: Interview compared to free play assessment context. *Journal of Speech and Hearing Research*. April, vol. 35, no. 2, pp. 343-353.

FARAONE, S. V., SERGEANT, J., GILLBERG, C. and BIEDERMAN, J., 2003. The worldwide prevalence of ADHD: is it an American condition?. *World Psychiatry*. June, vol. 2, no. 2, pp. 104-13.

FARAONE, S. V., PERLIS, R. H., DOYLE, A. E., SMOLLER, J. W., GORALNICK, J. J., HOLMGREN, M. A. and SKLAR, P., 2005. Molecular genetics of attention-deficit/hyperactivity disorder. *Biological Psychiatry*. June, vol. 57, no. 11, pp. 1313–1323.

FORD, T., GOODMAN, R. and MELTZER, H., 2003. The British child and adolescent mental health survey 1999: the prevalence of DSM-IV disorders. *Journal of the American Academy of Child and Adolescent Psychiatry*. October, vol. 42, no. 10, pp.1203-1211.

GARCIA COLL, C. and MAGNUSON, K., 2000. Cultural differences as source of developmental vulnerabilities and resources. In: J. P. SHONKOFF and S. J. MEISELS, eds. *Handbook of Early Childhood Intervention*. Cambridge: Cambridge University Press, pp. 94-114.

GARDNER, H. and FORRESTER, M., 2010. *Analysing interactions in childhood: Insights from conversation analysis*. Oxford: Wiley.

GEFFNER, D., 2006. Language and auditory processing problems in AD/HD. *The AD/HD Report*. June, vol.14, no. 3, pp.1-6.

GEURTS, H. M. and EMBRECHTS, M. T., 2008. Language profiles in ASF, SLI and ADHD. *Journal of Autism and Developmental Disorders*. November, vol. 38, no.10, pp. 1931-1943.

GEURTS, H. M., BROEDERS, M. and NIEUWLAND, M. S., 2010. Thinking outside the executive functions box: theory of mind and pragmatic abilities in attention deficit/hyperactivity disorder. *European Journal of Developmental Psychology*. January, vol. 7, no. 1, pp. 135-151.

GLEASON, J. B., 2005. *The development of language*. 6th ed. Boston: Pearson Education, Inc.

GOLDIN-MEADOW, S. and SALTMAN, J., 2000. The culture bounds of maternal accommodation: how Chinese and American mothers communicate with their deaf and hearing children. *Psychology Sciences*. July, vol. 11, no. 4, pp. 307-314.

GREEN, B. C., JOHNSON, K. A. and BRETHERTON, L., 2014. Pragmatic language difficulties in children with hyperactive and attention problems: An integrated review. *International Journal of Language and Communication Disorders*. January-February, vol. 49, no. 1, pp.15-29.

GROSS-TSUR, V., SHALEVM, R. S. and AMIR, N., 1991. Attention deficit disorder: association with familial-Genetic factors. *Pediatric Neurology*. July-August, vol. 7, no. 4, pp. 283-326.

GUALTIERI, C., KORIATH, U., VAN BOURGONDIEN, M. and SALEEBY, N., 1983. Language disorders in children referred for psychiatric services. *Journal of the American Academy of Child Psychiatry*. March, vol. 22, no. 2, pp. 65-171.

HAMLETT, K. W., PELLIGRINI, D. S. and CONNERS, C. K., 1987. An investigation of executive processes in the problem solving of attention deficit disorder hyperactivty children. *Journal of Pediateric Psychology*. June, vol. 12, no. 2, pp. 227-240.

HARLEY, T., 2001. *The psychology of language: From data to theory.* New York: Psychology Press.

HART, B. and RISLEY, T. R., 1999. *The social world of children learning to talk.* Batimore: Paul H. Brookes Publishing Co.

HARTSOUGH, C. S. and LAMBERT, N. M., 1985. Medical factors in hyperactive and normal children: Prenatal, developmental, and health history findings. *American Journal of Orthopsychiatry*. April, vol. 55, no. 2, pp. 190–210.

HASSAN, A. M., AL-HAIDAR, F., AL-ALIM, F. and AL-HAG, O., 2009. A screening tool for attention deficit hyperactivity disorder in children in Saudi Arabia. *Annals of Saudi Medicine*. July-August, vol.29, no.4, pp. 294–298.

HEGDE, M. N., 2003. *Clinical research in communicative disorders: Principles and strategies*. 3rd ed. Austin: Pro.ed.

HEILMANN, J. J., MILLER, J. F. and NOCKERTS, A., 2010. Using language sample databases. *Language, Speech, and Hearing Services in Schools*. January, vol. 41, no. 1, pp. 84-95.

HEWITT, L., 2000. Assessing communicative intents: A situated pragmatics approach. *Seminars in Speech and Language*. June, vol. 21, no. 3, pp. 257-266.

HOFF, E., 2010. Context effects on young children's language use: The influence of conversational setting and partner. *First Language*. August, vol. 30, no. 3-4, pp. 461-472.

HOFF, E., 2003. Causes and consequences of SES-related differences in parent-to-child speech. In: M. H. BORNSTEIN and R. H. BRADLEY, eds. *Socioeconomic status, parenting, and child development*. Mahwah, NJ: Lawrence Erlbaum, pp. 147–160.

HOFF, E., 2001. *Language development*. 2nd ed. Belmont, CA: Wadsworth/Thompson Learning.

HUMPHRIES, T., KOLTUN, H., MALONE, M. and ROBERTS, W., 1994. Teacher-identified oral language difficulties among boys with attention problems. *Journal of Developmental Behavioural Pediatrics*. April, vol. 15, no. 2, pp. 92-98.

IRWIN, D. L., PANNBACKER, M. and LASS, N. J., 2008. *Clinical research methods in speech-language pathology and audiology.* San Diego: Plural Publishing.

JAMIESON, J. R., 1994. Teaching as transaction: Vygotskian perspectives on deafness and mother-child interaction. *Exceptional Children*. March-April, vol. 60, no. 5, pp. 434-449.

JENAHI, E., KHALIL, S. and BELLA, H., 2012. Prevalence of attention deficit hyperactivity symptoms in female schoolchildren in Saudi Arabia. *Annals Saudi Medicine Journal*. September-October, vol. 32, no. 5, pp. 462-468.

JOHNSTON, C. and MASH, E. J., 2001. Families of children with attention deficit/ hyperactivity disorder: Review and recommendation for future research. *Clinical Child and Family Psychology Review*. September, vol. 4, no. 3, pp. 183-208.

JOHNSTON, J. R. and WONG, M. Y. A., 2002. Cultural differences in beliefs and practices concerning talk to children. *Journal of Speech Language Hearing Research*. October, vol. 45, no. 5, pp. 916-926.

JONES, K., DALEY, D., HUTCHINGS, J., BYWATER, T. and EAMES, C., 2007. Efficacy of incredible years program as an early intervention for children with conduct problems and ADHD: Long-term follow-up. *Child: care, health, and development*. May, vol. 34, no. 3, pp. 380-390.

JUSTICE, L. M., BREIT-SMITH, A. and ROGERS, M., 2010. Data Recycling: Using existing database to increase research capacity in speech-language development and disorders. *Language, Speech, and Hearing Services in Schools*. January, vol. 41, no. 1, pp. 39-43.

KARLOVIC, D., ZORICIC, Z., BULJAN, D., CRNKOVIC, D. and MARTINAC, M., 2002. Correspondence between DSM IV ADHD and ICD-10 hyperactive disorder in Croatian sample. *Acta Clinica Croatica*. June, vol. 41, no. 4, pp. 323-326.

KEENAN, E. and SCHIEFFELIN, B., 1976. Topic as a discourse notion: A study of topic in the conversations of children and adults. In: C. LI, ed. *Subject and topic: A new typology of language.* New York: Academic Press, pp. 43-71.

KESSLER, R. C., ADLER, L., BARKLEY, R. A., BIEDERMAN, J., CONNERS, C. K., DEMLER, O., FARAONE, S. V., GREENHILL, L., HOWES, M. J., SECNIK, K., SPENCER, T., USTUN, T. B., WALTERS, E. and ZASLAVSKY, A., 2006. The prevalence and correlates of adult ADHD in the United States: Results from the national comorbidity survey replication. *American Journal of Psychiatry*. April, vol. 163, no. 4, pp. 716-723.

KETALAARS, M. P., CUPERUS, J., JANSONIUS, K. and VERHOEVEN, L., 2010. Pragmatic language impairment and associated behavioural problems [Electronic Version]. *International Journal of Language and Communication Disorders,* 28, 1-17 Retrieved November 5, 2012, from htpp://www.catchword.com/nw=1/rpsv/cw/tandf/13682822/ contpl.htm.

KIELING, C., KIELING, R. R., ROHDE, L. A., FRICK, P. J., MOFFITT, T., NIGG, J. T., TANNOCK, R., XAVIER, F. and CASTELLANOS, F. X., 2010. The age at onset of attention deficit hyperactivity disorder. *American Journal of Psychiatry*. January, vol. 167, no. 1, pp. 14-16.

KIM, O. and KAISER, A., 2000. Language characteristics of children with ADHD. *Communication Disorders Quarterly.* Spring, vol. 21, no. 3, pp. 154-165.

KLECAN-AKER, J. S. and SWANK, P., 1988. The use of pragmatic protocol with normal pre-school children. *Journal of Communication Disorders*. February, vol. 21, no. 1, pp. 85-102.

LAHEY, M., 1988. *Language development and language disorders.* New York: MacMillan

LANDAU, S. and MILICH, R., 1988. Social communication patterns in attention deficit disordered boys. *Journal of Abnormal Child Psychology*. February, vol. 16, no. 1, pp. 69–81.

LASKY, E. Z. and KLOPP, K., 1982. Parent-child interactions in normal and language disordered children. *Journal of Speech and Hearing Disorders.* February, vol. 47, no. 1, pp. 7-18.

LEINONEN, E., LETTS, C. and SMITH, B. R., 2002. *Children's pragmatic communication difficulties.* London: Whurr Publishers.

LEONARD, M. A., MILICH, R. and LORCH, E. P., 2011. The role of pragmatic language use in mediating the relation between hyperactivity and inattention and social skills problems. *Journal of Speech, Language, and Hearing Research*. April, vol. 54, no. 2, pp. 567-579

LI, D., SHAM, P. C., OWEN, M. J. and HE, L., 2006. Meta-analysis shows significant association between dopamine system genes and attention deficit hyperactivity disorder (ADHD). *Human Molecular Genetics*. July, vol.15, no. 14, pp. 2276–2284.

LOVE, A. J. and THOMPSON, M. G. G., 1988. Language disorders and attention deficit disorder in young children referred for psychiatric services. *American Journal of Orthopsychiatry*. January, vol. 58, no. 1, pp. 52-64.

MACDONALD, J. D. and CARROLL, J. Y., 1992. Communicating with young children. *American Journal of Speech-Language Pathology*. September, vol. 1, no. 3, pp. 39-48.

MANN, E. M., IKEDA, Y., MUELLER, C. W., TAKAHASHI, A., TAO, K. T., HUMIS, E., LI, B. L. and CHIN, D., 1992. Cross-cultural differences in rating hyperactive-disruptive behaviours in children. *American Journal of Psychiatry*. November, vol. 149, no. 11, pp. 1539–1542.

MASH, E. J. and JOHNSTON, C., 1982. A comparison of the mother-child interactions of younger and older hyperactive and normal children. *Child Development*. October, vol. 53, no. 5, pp.1371-1381.

MATHERS, M., 2007. *Language use in children with attention deficit hyperactivity disorder.* Unpublished PhD thesis, University of Newcastle, Australia.

MCINNES, A., HUMPHRIES, T., HOGG-JOHNSON, S. and TANNOCK, R., 2003. Listening comprehension and working memory are impaired in attention-deficit hyperactivity disorder irrespective of language impairment. *Journal of Abnormal Child Psychology*. August, vol. 31, no. 4, pp. 427-443.

MCKIBBIN, R. C. and HEGDE, M. N., 2011. *An advanced review of speech-language pathology: Preparation for NESPA and comprehensive examination*. 3rd ed. Austin: Pro.ed.

MCTEAR, M. F. and CONTI-RAMSDEN, G., 1992. *Pragmatic disability in children*. San Diego: Singular Publishing Group.

MENTIS, M. and PRUTTING, C. A., 1991. Analysis of topic as illustrated in a head-injured and a normal adult. *Journal of Speech and Hearing Research*. June, vol. 34, no. 3, pp. 583-595.

MEY, J. L., 2001. *Pragmatics: An introduction.* 2nd ed. Oxford: Blackwell publishing.

MILLER, J. F., 1991. *Research on child language disorders: A decade of progress.* Austin: Pro-Ed.

MILLER, J. F., 1981. *Assessing language production in children.* Austin: Pro-Ed.

MILLER, L., 1978. Pragmatics and early childhood language disorders: Communicative Interaction in a half-hour sample. *Journal of Speech and Language Disorders*. November, vol. 43, no. 4, pp. 419-436.

MODESTO-LOWE, V., DANFORTH, S. and BROOKS, D., 2008. ADHD: does parenting style matter?. *Clinical Pediatrics*. November, vol. 47, no. 9, pp. 865-872.

MUELLER, K. L. and TOMBLIN, J. B., 2012. Examining the comorbidity of language impairment and attention-deficit/hyperactivity disorder. *Topics in Language Disorders*. July-September, vol. 32, no. 3, pp. 228-246.

NICOLOSI, L., HARRYMAN, E. and KRESECK, J., 2004. *Terminology of communication disorders.* 5th ed. Philadelphia: Lippincott Williams & Wilkins.

NIGG, J. T., 2012. Future directions in ADHD etiology research. *Journal of Clinical Child & Adolescent Psychology*. May, vol. 41, no. 4, pp. 524-533.

NIJMEIJER, J. S., MINDERAA, R. B., BUITELAAR, J. K., MULLIGAN, A., HARTMAN, C. A. and HOEKSTRA, P. J., 2008. Attention-deficit/hyperactivity disorder and social dysfunctioning. *Clinical Psychology Review.* April, vol. 28, no. 4, pp. 692-708.

NILSON, E. S., MANGAL, L. and MACDONALD, K., 2013. Referential communication in children with ADHD: Challenges in the role of listener. *Journal of Speech, Language, and Hearing Research.* April, vol. 56, no. 2, pp. 590-603.

NIPPOLD, M. A., HESKETH, L. J., DUTHIE, J. K. and MANSFIELD, T. C., 2005. Conversational versus expository discourse: A study of syntactic development in children, adolescents, and adults. *Journal of Speech, Language, and Hearing Research.* October, vol. 48, no. 5, pp. 1048-1064.

NIPPOLD, M. A., MANSFIELD, T. C., BILLOW, J. L. and TOMBLIN, J. B., 2008. Expository discourse in Adolescents with Language Impairments: Examining syntactic development. *American Journal of Speech-Language Pathology*. November, vol. 17, no. 4, pp. 356–366.

NORBURY, C., 2014. Practitioner review: Social (pragmatic) communication disorder conceptualization, evidence and clinical implications. *Journal of Child Psychology and Psychiatry*. March, vol. 55, no. 3, pp. 204-216.

NORRIS, J. A. and HOFFMAN, P. P., 1990. Comparison of adult-initiated vs. child-initiated interaction styles with handicapped paralanguage children. *Language, Speech, and Hearing Services in Schools*. August, vol. 21, no. 4, pp. 28-36.

ORAM, J., FINE, J., OKAMOTO, C. and TANNOCK, R., 1999. Assessing the language of children with attention deficit hyperactivity disorder. *American Journal of Speech-Language Pathology*. February, vol. 8, no.1, pp. 72-80.

OWENS, R.E., 2009. *Language disorders: A functional approach to assessment and intervention.* 5th ed. Boston: Allyn &Bacon.

OYER, H. J., HALL, B. J. and HAAS, W.H., 1994. *Speech, language, and hearing disorders: A guide for the teacher.* Boston: Allyn & Bacon.

PEÑA, E. D., GILLAM, R. B. and BEDORE, L. M., 2014. Dynamic assessment of narrative ability in English accurately identifies language impairment in English language learners. *Journal of Speech, Language, and Hearing Research*, 2014 Jul 30. doi: 10.1044/2014_JSLHR-L-13-0151.

PEPPER, J. and WEITZMAN, E., 2004. *It takes two to talk: A practical guide for parents of children with language delays.* 3rd ed. Toronto: Hanen Center Publication.

PERKINS, M., 2007. *Pragmatic impairment.* Cambridge: Cambridge University Press.

PHELPS-TERASAKI, D. and PHELPS-GUNN, T., 1992. *Test of pragmatic language*. Hove: Psychological Corporation.

PLAPINGER, D. and KRETSCHMER, R., 1991. The effect of context on the interactions between a normally hearing mother and her hearing-impaired child. *The Volta Review*. February-March, vol. 93, no. 2, pp. 75-87.

PRESTON, P., 2005. *Testing children: A practitioner's guide to the assessment of mental development in infants and young children.* Washington: Hogrefe & Huber Publishers.

PRUTTING, C., 1982. Pragmatics as social competence. *Journal of Speech Hearing Disorders.* May, vol. 47, no. 2, pp. 123-134.

PRUTTING, C. and KIRCHNER, D., 1987. A clinical appraisal of the pragmatic aspects of language. *Journal of Speech Hearing Disorder*. May, vol. 52, no. 2, pp. 105-119.

PURVIS, K. L. and TANNOCK, R., 2000. Phonological processing not inhibitory control, differentiates ADHD and reading disability. *Journal of American Academy of Child & Adolescent Psychiatry*. April, vol. 39, no. 4, pp. 485-494.

PURVIS, K. L. and TANNOCK, R., 1997. Language abilities in children with attention deficit hyperactivity disorder, reading disabilities, and normal controls. *Journal of Abnormal Child Psychology*. April, vol. 25, no. 2, pp. 133-144.

REDMOND, S. M., 2011. Peer victimization among students with specific language impairment, attention-deficit/hyperactivity disorder, and typical development. *Language, Speech, and Hearing Services in Schools*. October, vol. 42, no. 4, pp. 520-535.

REDMOND, S. M., 2004. Conversational profiles of children with ADHD, SLI and typical development. *Clinical Linguistics & Phonetics*. March, vol. 18, no. 2, pp. 107-125.

RENNIE, T. J., 2003. The communicative competency of boys with attention deficit hyperactivity disorder. *Connections*. August, vol. 3, no.3, pp. 69-89.

RICHARD, G. J. and RUSSELL, J. L., 2001. The source for ADD/ADHD: Attention deficit disorder and attention deficit hyperactivity disorder. NY: Lingui Systems, Inc.

RICKEL, A. U. and BROWN, R. T., 2007. *Attention-deficit/hyperactivity disorder in children and adults.* Washington: Hogrefe and Huber Publishers.

RIEF, S. F., 2005. *How to reach and teach children with ADD/ADHD: Practical techniques, strategies, and interventions.* 2nd ed. San Francisco: Jossey-Bass.

RIEF, S.F., 2003. *The ADHD book of lists: A practical guide for helping children and teens with attention deficit disorders.* San Francisco: Jossey-Bass.

SACKS, H., 1995. *Lectures on Conversation.* Oxford: Blackwell.

SCHOBER-PETERSON, D. and JONSON, C. J., 1989. Conversational topics of 4-year-olds. *Journal of Speech and Hearing Research*. December, vol. 32, pp. 857-870.

SCOTT, C. M. and TAYLOR, A. E., 1978. A comparison of home and clinic gathered language samples. *Journal of Speech and Hearing Disorders*. November, vol. 43, pp. 482-495.

SEMEL, E., WIIG, E. and SECORD, W., 2000. *Clinical evaluation of language fundamentals.* 3rd ed. Hove: Psychological Corporation.

SHAW, P., ECKSTRAND, K., SHARP, W., BLUMENTHAL, J., LERCH, J. P. and GREENSTEIN, D., 2007. Attention-deficit/hyperactivity disorder is characterized by a delay in cortical maturation. *Proceeding of the National Academy of Sciences of the United States of America*. December, vol. 104, no. 49, pp. 19649-19654.

SILVER, L. B., 2004. *Attention deficit/hyperactivity disorder: A clinical guide to diagnosis and treatment for health and mental health professionals.* 3rd ed. Arlington: American Psychiatric Publishing.

SILVERMAN, F. H., 2003. *Essentials of speech, language, and hearing disorders.* Cincinnati, OH: Atomic Dog Publishing.

SKOUNTI, M., PHILALITHIS, A. and GALANAKIS, E., 2007. Variations in prevalence of attention deficit hyperactivity disorder worldwide. *European Journal of Paediatrics*. February, vol. 166, no. 2, pp. 117-123.

SPENCER, T. J., BIEDERMAN, J., WILENS, T. E. and FARAONE, S.V., 2002. Overview and neurobiology of attention-deficit/hyperactivity disorder. *Journal of Clinical Psychiatry*. December, vol. 63, no. 12, pp. 3-9.

STAIKOVA, E., GOMES, H., TARTTER, V., MCCABE, A. and HALPERIN, J. M., 2013. Pragmatic deficit and social impairment in children with ADHD. *The Journal of Child Psychology and Psychiatry*. December, vol. 54, no. 12, pp. 1275-1283.

STECH, E. L., 1982. The analysis of conversational topic sequence structures. *Semiotica.* January, vol. 39, no. 2, pp. 75-91.

STIVERS, T., ENFIELD, N., BROWN, P., ENGLERT, C., HAYASHI, M. and HEINEMANN, T., 2009. Universals and cultural variation in turn taking in conversation. *Proceedings of the National Academy of Sciences of the United States of America*. April, vol. 106, no. 26, pp. 10587-10592.

SZATMARI, P., OFFORD, D. R. and BOYLE, M. H., 1989. Correlates, associated impairments, and patterns of service utilization of children with attention deficit disorders: Findings from the Ontario child health study. *Journal of Child Psychology*. March, vol. 30, no. 2, pp. 205–217.

TALLMADGE, J. and BARKLEY, R. A., 1983. The interactions of hyperactive and normal boys with their mothers and fathers. *Journal of Abnormal Child Psychology*. December, vol. 11, no. 4, pp. 565-579.

TANNOCK, R., 2002. *Learning Disabilities: Implications for Psychiatric Treatment.* Washington, DC: American Psychiatric Press Inc.

TANNOCK, R., 1998. ADHD: Advances in cognitive, neurobiological and genetic research. *Journal of Child Psychology and Psychiatry*. January, vol. 39, no.1, pp. 65-99.

TANNOCK, R. and SCHARCHAR, R., 1996. Executive dysfunction as an underlying mechanism of behaviour and language problems in attention deficit hyperactivity disorder. In: J.H. BEITHCHMAN, N.J. Cohen, N.M. KONSTANTAREAS, and R. TANNOCK, eds. *Language, learning, and behaviour disorders: Developmental, biological, and clinical perspectives.* New York: Cambridge University Press, pp.128-155.

TANNOCK, R., PURVIS, K. L. and SCHACHAR, R. J., 1993. Narrative abilities in children with attention deficit hyperactivity disorder and normal peers. *Journal of Abnormal Child Psychology*. February, vol. 21, no. 1, pp. 103–117.

TANNOCK, R., FINE, J., HEINTZ, T. and SCHACHAR, R., 1995. A linguistic approach detects stimulant effects in two children with attention deficit hyperactivity disorder. *Journal of Child and Adolescent Psychopharmacology*. Fall, vol. 5, no. 3, pp. 177–189.

TAYLOR, E., 2011. Antecedents of ADHD: A historical account of diagnostic concepts. *Attention Deficit and Hyperactivity Disorders*. June, vol. 3, no. 2, pp. 69–75.

THAPAR, A., COOPER, M., EYRE, O. and LANGLEY, K., 2013. Practitioner review: What have we learnt about the causes of ADHD? *Journal of Child Psychology and Psychiatry*. January, vol. 54, no. 1, pp. 3-16.

TIMLER, G. R., 2014. Use of the children's communication checklist-2 for classification of language impairment risk in young school-age children with attention-deficit/hyperactivity disorder. *American Journal of Speech-Language Pathology*. February, vol. 23, no. 1, pp. 73-83.

TIROSH, E. and COHEN, A., 1998. Language deficit with attention-deficit disorder: A prevalent comorbidity. *Journal of Child Neurology*. October, vol. 13, no. 10, pp. 493-497.

TOMBLIN, J. B. and MUELLER, K. L., 2012. How can comorbidity with attention-deficit/hyperactivity disorder aid understanding of language and speech disorders. *Topics in Language Disorders*. July-September, vol. 32, no. 3, pp. 198-206.

TOMBLIN, J. B., RECORDS, N. L., BUCKWALTER, P., ZHANG, X., SMITH, E. and O'BRIEN, M., 1997. Prevalence of specific language impairment in kindergarten children. *Journal of Speech, Language, and Hearing Research*. December, vol. 40, no. 6, pp. 1245-60.

TRAUTMAN, R. C., GIDDAN, J. J. and JURS, S.G., 1990. Language risk factor in emotionally disturbed children within a school and day treatment program. *Journal of Childhood Communication Disorders*. April, vol. 13, no. 2, pp. 123-133.

VAIDYA, C. J., 2012. Neurodevelopmental abnormalities in ADHD. *Current Topics in Behavioural Neurosciences*. April, vol. 9, no. 2, pp. 49-66.

WANASKA, S. K., BEDROSIAN, J. L. and POHLMAN, J. C., 1986. Effects of play materials on the topic performance of preschool children. *Language, Speech, and Hearing Services in School*. July, vol. 17, pp. 152-159.

WARR-LEEPER, G., WRIGHT, N. A. and MACK, A., 1994. Language disabilities of antisocial boys in residential treatment. *Behavioural Disorders*. May, vol. 19, no. 3, pp. 159-169.

WESTBY, C. E. and WATSON, S., 2010. ADHD and communication disorders. In: J. S. DAMICO, N. MULLER & M. J. BALL, eds. *The Handbook of Language and Speech Disorders.* Hong Kong: Wiley-Black Well, pp. 529-555.

WEYANDT, L. L. 2007. *An ADHD primer.* 2nd ed. New Jersey: Lawrence Erlbaum Associates.

WICHSTRØM, L., BERG-NIELSEN, T. S., ANGOLD, A., EGGER, H. L., SOLHEIM, E. and SVEEN, T. H., 2012. Prevalence of psychiatric disorders in preschoolers. *Journal of Child Psychology and Psychiatry*. June, vol. 53. no. 6, pp. 695–705.

WIIG, E. and SECORD, W., 1989. *Test of language competence- expanded edition*. Hove: Psychological Corporation.

WILLCUT, E. G., 2012. The prevalence of DSM-IV attention-deficit/hyperactive disorder: A meta-analytic review. *Neurotherapeutics*. July, vol. 9, no. 3, pp. 490-499.

WILLCUT, E. G., DOYLE, A. E., NIGG, J. T., FARAONE, S. V. and PENNINGTON, B. F., 2005. Validity of executive function theory of attention-deficit/hyperactivity disorder: A meta-analytic review. *Biological Psychiatry*. June, vol. 57, no. 11, pp. 1336-1346.

WILLIAMS, N. M., ZAHARIEVA, I., MARTIN, A., LANGLEY, K., MANTRIPRAGADA, K., FOSSDAL, R. and THAPAR, A., 2010. Rare chromosomal deletions and duplications in attention-deficit hyperactivity disorder: A genome-wide analysis. *Lancet*. October, vol. 376, no. 9750, pp. 1401–1408.

WORLD HEALTH ORGANIZATION, 1993. *The ICD-10 classification of Mental and Behavioural Disorders.* Geneva: WHO.

ZENTALL, S. S., 1993. Research on the educational implications of attention deficit hyperactivity disorder. *Exceptional Children*. October-November, vol. 60, no. 2, pp. 143–153.

ZENTALL, S. S., 1989. Attentional cueing in spelling tasks for hyperactive and comparison regular classroom children. *Journal of Special Education*. Spring, vol. 23, no. 1, pp. 83–93.

ZENTALL, S. S., 1988. Production deficiencies in elicited language but not in the spontaneous verbalizations of hyperactive children. *Journal of Abnormal Child Psychology*. December, vol. 16, no. 6, pp. 657-673.

ZENTALL, S. S. and KRUCZEK, T., 1988. The attraction of color for active attention-problem children. *Exceptional Children*. January, vol. 54, no. 4, pp. 519–536.

ZENTALL, S.S., GOHS, D.E. and CULLATTA, B., 1983. Language and activity of hyperactive and comparison children during listening tasks. *Exceptional children*. February, vol. 50, no. 1, pp. 255-266.